CHAPTER 7

TREATMENT PERFORMANCE DATA USED FOR THE DEVELOPMENT OF CANDIDATE PRETREATMENT STANDARDS

7.1 Introduction

This chapter discusses the treatment performance data available to EPA for use in developing candidate pretreatment standards for the pollutants of concern. Chapter 5 of this document discusses the pollutants of concern. The following information is presented in this chapter:

- Section 7.2 describes the sources of the treatment performance data from well-operated and well-designed treatment systems used by EPA in the calculation of the long-term averages, variability factors, and candidate pretreatment standards and classifies these sources into five postlaundering treatment options;
- Section 7.3 describes the data-editing procedures used to identify data points considered appropriate for calculating long-term averages, variability factors, and candidate pretreatment standards for the five postlaundering treatment options;
- Section 7.4 presents the long-term averages for the five postlaundering treatment options for the pollutants of concern;
- Section 7.5 presents the methodology for determining pollutants of concern selected for candidate pretreatment standards development and the pass through analysis;
- Section 7.6 presents the long-term average concentrations and variability factors developed for the five treatment options for the pollutants of concern, which can be used to develop local limits based on best engineering judgement;
- Section 7.7 presents EPA's analysis on the development of candidate mass-based standards; and
- Section 7.8 presents the references used.

7.2 Sources of Treatment Technology Performance Data From Well-Designed and Well-Operated Treatment Systems

EPA used three sources of treatment performance data to calculate the long-term average concentrations, variability factors, and candidate pretreatment standards for industrial laundries wastewater treatment options: 1) EPA industrial laundry sampling data, 2) Detailed

Monitoring Questionnaire (DMQ) data, and 3) other industry-supplied data. Chapter 3 of this document describes these sources. EPA first considered sampling data it had collected from industrial laundries with well-designed and well-operated treatment systems representing the various treatment options. Chapter 6 of this document describes the treatment technologies used by the industrial laundries industry. EPA also considered DMQ and other industry-supplied data from facilities using treatment technologies equivalent to the treatment technologies sampled by EPA. Sections 7.2.1, 7.2.2, and 7.2.3 discuss the EPA industrial laundry sampling data, the DMQ data, and the other industry-supplied data used to develop candidate pretreatment standards.

7.2.1 Industrial Laundry Sampling Program Data

EPA considered industrial laundry wastewater data from two Agency sampling programs for use in calculating long-term average concentrations, variability factors, and candidate pretreatment standards: 1) the 1985-1987 Industrial Technology Division (ITD)/Resource Conservation and Recovery Act (RCRA) Sampling Program and 2) the EPA Office of Water 1993-1998 sampling program. EPA did not use data from the 1985-1987 ITD/RCRA Sampling Program to calculate long-term averages, variability factors, and candidate pretreatment standards. Instead, EPA did use data from the 1993-1998 sampling program in these calculations. The identification of sampling data representative of well-designed and well-operated treatment systems from these sampling programs is presented below.

7.2.1.1 1985-1987 ITD/RCRA Sampling Program

EPA collected wastewater samples from five industrial laundries between 1985 and 1987 as part of the ITD/RCRA Sampling Program. EPA reviewed the ITD/RCRA Sampling Program data to identify facilities with well-designed and well-operated treatment systems representative of wastewater treatment technologies used as the basis for the candidate pretreatment. EPA determined that none of the ITD/RCRA Sampling Program data could be used to calculate long-term average concentrations, variability factors, or candidate pretreatment standards, for the following reasons. One facility used a dissolved air flotation unit that was not operating properly during the sampling episode. EPA decided that the sampling data from this facility could not be used because the treatment system was not well operated. At a second facility, grab sample water was added to some of the composite samples to make up for insufficient volume of the composite samples. EPA decided that sampling data for this facility were not representative of the wastewater from the facility. A third facility used microfiltration as its main treatment technology. EPA does not consider microfiltration to be an easily operated treatment technology for industrial laundry wastewater because the filter is easily clogged from oil and grease in the wastewater. This is supported by several industrial laundries that tried using microfiltration without the appropriate pretreatment of oil and grease and total suspended solids (TSS), and have subsequently replaced the microfilter with a different technology. The final two facilities used only settling basins; however, EPA does not consider settling basins to represent effective treatment for the pollutants of concern in industrial laundry wastewater. Therefore, EPA decided that sampling data from these five facilities could not be used to develop candidate pretreatment standards.

7.2.1.2 1993-1998 EPA Sampling Program

EPA collected wastewater samples from nine industrial laundries between 1993 and 1998 as part of the data-gathering effort for development of an effluent guideline for the industrial laundries industry. Facilities for sampling were selected based on site visits and responses to the 1994 Industrial Laundries Industry Questionnaire (detailed questionnaire). One sampling episode was performed at each facility. The sampling data collected by EPA included both influent and effluent wastewater data representing the major treatment technology used by each facility. At each facility, EPA collected pollutant concentration data for all of the pollutants of concern. The nine sampled industrial laundries used at least one of the following major wastewater treatment technologies as part of their overall treatment system:

- Chemical emulsion breaking;
- Dissolved air flotation (DAF);
- Chemical precipitation;
- Ultrafiltration;
- Vacuum degassing; and
- Organics control (steam tumbling).

EPA classified the data from the nine sampled facilities by the treatment technology used by the facility and the type of wastewater treated by the treatment technology. Some of the sampled facilities treated all of their process wastewater while others treated only heavy wastewater (i.e., wastewater from the washing of heavily soiled items (e.g., shop and printer towels/rags) or wastewater containing high pollutant concentrations from certain breaks in the washing cycle).

EPA's sampling data for microfiltration represent one day of treatment of wastewater from laundering of only printer towels. In addition, as discussed earlier in this section, microfilters are easily clogged from oil and grease in industrial laundry wastewater. The data obtained by EPA during a sampling episode at an industrial laundry using vacuum degassing do not demonstrate effective treatment of industrial laundry wastewater. Vacuum degassing is used to remove volatile organics from wastewater. The sampling data for vacuum degassing did not demonstrate effective removal of volatile organics. Because vacuum degassing were not found to be effective in treating industrial laundry wastewater, and EPA did not have enough data for microfiltration to evaluate treatment performance and because of operational complexities, EPA did not calculate long-term average concentrations, variability factors, or candidate pretreatment standards for these treatment technologies.

EPA had limited data available for steam tumbling, from one load of steam-tumbled printer towels and from one load of non-steam-tumbled printer towels. EPA developed target effluent concentrations for this prelaundering treatment technology instead of long-term averages, variability factors, and candidate pretreatment standards. Chapter 6 of this document presents the treatment performance data for steam tumbling.

The remaining sampling data represented the following five treatment options based on the treatment technology used by the facility and whether the facility sampled was treating all of its process wastewater or only heavy wastewater:

- Chemical emulsion breaking treatment of heavy wastewater;
- DAF treatment of heavy wastewater;
- Chemical precipitation treatment of heavy wastewater;
- DAF treatment of all facility process wastewater; and
- Chemical precipitation treatment of all facility process wastewater.

Sampling data from the seven facilities representing these five treatment options were used to calculate long-term average concentrations, variability factors, and candidate pretreatment standards. The number of sampled facilities representing each treatment option is presented in the following table.

Number of EPA Sampled Facilities Representing Each Treatment Option				
Chemical Emulsion Breaking Treatment of Heavy Wastewater	**DAF Treatment of Heavy Wastewater**	**Chemical Precipitation of Heavy Wastewater**	**DAF Treatment of All Facility Process Wastewater**	**Chemical Precipitation of All Facility Process Wastewater**
1	1	1	2	2

7.2.2 Detailed Monitoring Questionnaire (DMQ) Data

In 1995, EPA developed and mailed the DMQ to 37 industrial laundries throughout the United States (as described in Chapter 3 of this document). In response to this questionnaire, these industrial laundries provided EPA with all available 1993 facility monitoring data. DMQ data generally represented fewer pollutants than were analyzed for during the sampling program, and most of the data provided were for final effluent only, without corresponding influent data to evaluate treatment system pollutant removals. EPA reviewed the DMQ data to determine if the data could be used to represent any of the five treatment options sampled by EPA.

EPA determined that 17 of the 37 DMQ facilities did not provide data representative of the treatment technologies that were considered bases for candidate pretreatment standards. Facility diagrams for the remaining 20 facilities using one of these three treatment technologies were examined to determine if the sampling points for which data were reported represent final effluent from the treatment technology. EPA determined that data from 9 of the 20 facilities did not meet this criterion. The remaining 11 facilities provided data representing wastewater effluent concentrations for either DAF treatment of all facility process wastewater (five facilities) or chemical precipitation treatment of all facility process wastewater (six facilities). One of the five DAF facilities did not provide any data for pollutants of concern and one of the six chemical precipitation facilities only provided two data points for each pollutant of concern; therefore, data from these facilities were not used to calculate long-term averages, variability factors, or candidate pretreatment standards. Data from four DAF facilities

and five chemical precipitation facilities were used in conjunction with EPA's sampling data to calculate long-term average concentrations, variability factors, and candidate pretreatment standards. For the four DAF facilities, three operated induced air flotation (IAF) systems.

7.2.3 Other Industry-Supplied Data

Based on an analysis on all treatment performance data submitted in comments and gathered through EPA's data collection activities (excluding the DMQ), EPA determined that data from one facility were adequate to incorporate into EPA's loading estimates. Facilities that did not provide production amounts and types, portion of wastewater stream treated by the technology, the type of wastewater treatment technology operated, or total flow at the facility were determined to have not submitted enough data for EPA to perform a proper analysis of the data.

The data EPA used were from a towel only facility operating IAF. The final effluent data from this facility were used in conjunction with data previously gathered to represent treatment performance for facilities operating DAF and only treating wastewater from the water-washing of shop and or printer towels/rags.

7.3 Evaluation of Treatment Performance Data

After identifying available treatment performance data, EPA identified specific data points that could not be used to evaluate treatment system performance. These data were not used to calculate long-term averages, variability factors, and candidate pretreatment standards. The following criteria were used to identify these data points:

- Assessment of the treatment system performance at facilities identified above, including identification of process upsets during sampling that impacted the performance of the treatment system;
- Identification of pollutants not treated by the treatment technology;
- Identification of pollutants not present in influent samples at sufficient concentrations to evaluate treatment effectiveness of the treatment technology;
- Identification of treatment performance data with inconsistent detection limits; and
- Identification of data considered a lower limit of the actual value.

These criteria are further described in Sections 7.3.1 through 7.3.5 of this document.

7.3.1 Assessment of Treatment System Performance and Identification of Process Upsets

EPA reviewed the available data to determine if the treatment systems for which effluent data were available were well operated at the time samples were collected. Data that did not meet this evaluation criterion were flagged as unusable. To determine good system operation, EPA used the following parameters, which are indicative of proper operation of the three major treatment technologies for which data were available:

- Chemical Emulsion Breaking: proper pH and removal of oil and grease;
- DAF: removal of TSS and oil and grease; and
- Chemical Precipitation: removal of TSS and oil and grease.

For EPA sampling episodes, EPA reviewed sampling episode reports to determine if any process upsets occurred during one or more days of each sampling episode and if the treatment systems showed good performance based on removal of the parameters listed above. For DMQ and industry-supplied data, EPA used the following design and operating criteria to evaluate treatment system performance:

- Chemical Emulsion Breaking--pH of wastewater is adjusted with acid and an oil removal mechanism is in place.
- DAF--flocculation and coagulation chemicals are added, and an air injection mechanism and a removal system for float sludge are in place.
- Chemical Precipitation--flocculation and coagulation chemicals are added and a settling mechanism is in place.

Pollutant removals from DMQ and industry-supplied data could not be calculated because none of the facilities representing one of the three major wastewater treatment technologies provided paired influent and effluent data.

7.3.2 Identification of Pollutants Not Treated by the Treatment Technology

EPA reviewed the data for each EPA sampling episode to identify pollutants that were not treated by the treatment technology sampled. If the average concentration of the pollutant in the effluent samples from a facility was greater than or equal to the average concentration of the pollutant in the influent samples, the data were flagged as unusable. The DMQ and industry-supplied data could not be evaluated using this criterion because no paired influent and effluent data were provided.

7.3.3 Identification of Pollutants Not Present in Influent Samples at Sufficient Concentrations to Evaluate Treatment Effectiveness

EPA reviewed the data for each EPA sampling episode to determine if a pollutant was not detected in sufficient concentrations to evaluate treatment effectiveness. If the pollutant was never detected in influent samples at a facility or if the average concentration of a pollutant in the influent samples collected from a facility was less than 10 times the method detection level for that pollutant, the data for that pollutant at that facility were flagged as unusable for calculating long-term averages, variability factors, and candidate pretreatment standards. For calculating the target average concentrations used to determine pollutant loadings and removals, EPA did not use the 10 times method detection level criterion. The DMQ and industry-supplied data could not be evaluated using this criterion because no facilities provided paired influent and effluent data.

7.3.4 Identification of Treatment Performance Data With Inconsistent Detection Limits

EPA reviewed the data for each pollutant at each sampling episode to identify results showing inconsistent detection limits. If an analytical method used for a pollutant during a particular episode gave inconsistent detection limits due to laboratories having different instruments to measure pollutant concentrations, the data for this pollutant and episode were flagged as unusable. EPA identified data from three sampling episodes for four organic pollutants (toluene, naphthalene, tetrachloroethene, and ethylbenzene) that showed inconsistent detection limits. EPA did not use these data in calculating long-term averages and variability factors.

7.3.5 Identification of Treatment Performance Data Considered a Lower Limit of the Actual Value

EPA reviewed the sampling data to identify pollutant concentrations qualified with a greater than (>) sign. For these pollutants, EPA considered the reported concentration value to be a lower limit of the actual concentration value. EPA did not use the data from these samples to calculate long-term averages and variability factors.

7.4 Calculation of Long-Term Average Concentrations for the Pollutants of Concern

EPA used the data meeting the review criteria presented in Section 7.3 of this document to calculate long-term average concentrations for the 72 pollutants of concern for each of the five postlaundering treatment options. Long-term averages for each pollutant of concern for each sampling episode were calculated using equations derived from an adapted delta-lognormal model that accounts for effluent samples with a pollutant concentration at the detection limit. The detection limit concentration was used in calculations for data points reported as nondetects. The Statistical Support Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category (1) presents the methodology used to calculate long-term averages. EPA calculated the overall long-term

average concentrations for each pollutant of concern by finding the median of the episode long-term average concentrations. When sampling, DMQ, and industry-supplied data met the data review criteria for a specific pollutant for a treatment technology group, EPA used these data to calculate long-term average concentrations. When only EPA sampling data met the data review criteria, EPA used only data from EPA-sampled facilities to calculate long-term average concentrations. When only DMQ and/or industry-supplied data met the data review criteria, EPA did not calculate long-term average concentrations for that pollutant for that treatment technology group because no facilities provided raw waste data. Therefore, EPA could not determine if the pollutant was present in the raw wastewater.

Table 7-1 presents the long-term average concentrations for each pollutant of concern for each of the five treatment options. The treatment technology options listed in Table 7-1 are defined as follows:

- CEB-Heavy represents data from facilities using chemical emulsion breaking treatment of heavy wastewater;
- DAF-Heavy represents data from facilities using DAF treatment of heavy wastewater;
- CP-Heavy represents data from facilities using chemical precipitation treatment of heavy wastewater;
- DAF-All represents data from facilities using DAF treatment of all facility process wastewater; and
- CP-All represents data from facilities using chemical precipitation treatment of all facility process wastewater.

7.5 Methodology for Determining Pollutants of Concern Selected for Candidate Pretreatment Standards Development

This section presents the methodology used to select pollutant parameters for which candidate pretreatment standards were calculated for the Industrial Laundries Point Source Category. These parameters were chosen from the list of 72 pollutants of concern presented in Chapter 5 of this document . Although all 72 pollutants of concern were used to estimate pollutant loading and pollutant reductions, only certain parameters were selected for calculating candidate pretreatment standards. Because monitoring for all 72 pollutants of concern is not necessary to ensure that industrial laundry wastewater pollutants are adequately controlled, EPA chose a subset of the 72 pollutants since a number of the pollutants do not pass through POTWs and many of the rest of the pollutants originate from similar sources and have similar properties and would be incidently removed by control of a smaller number of pollutants. EPA selected the pollutants for which candidate pretreatment standards were calculated to represent the entire population of the pollutants of concern; they include metals, organic compounds, and SGT-HEM

Table 7-1

Long-Term Average (LTA) Effluent Concentrations for the Five Treatment Options for the Pollutants of Concern

Pollutant of Concern	Median LTA (mg/L)[1]				
	CEB-Heavy[2]	DAF-Heavy[3]	CP-Heavy[4]	DAF-All[5]	CP-All[6]
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	1,040	1,310	1,390	497	399
Oil and Grease (measured as HEM)	268	230	38.2	37.8	28.5
Total Suspended Solids (TSS)	259	487	56.3	85.5	117
Priority Organics					
1,1,1-Trichloroethane	---	---	---	0.0277	0.471
1,2-Diphenylhydrazine	---	---	45.2	---	---
4-Chloro-3-methylphenol	0.205	---	---	0.220	---
Bis(2-ethylhexyl) Phthalate	0.462	0.604	0.0469	0.144	0.0691
Butyl Benzyl Phthalate	---	---	0.0100	---	0.0100
Chlorobenzene	---	---	---	0.0280	---
Chloroform	---	---	---	0.185	---
Di-*n*-butyl Phthalate	0.0100	0.173	0.0100	0.125	---
Di-*n*-octyl Phthalate	0.0307	---	---	0.236	0.0342
Ethylbenzene	0.305	1.37	0.0931	0.189	0.154
Isophorone	---	---	---	---	0.297
Methylene Chloride	---	---	---	0.546	---
Naphthalene	0.104	0.803	0.114	0.0764	0.0583
Phenol	---	---	---	0.211	---
Tetrachloroethene	0.286	---	0.127	0.250	0.421
Toluene	0.543	6.35	0.818	0.711	0.973
trans-1,2-Dichloroethene	---	---	---	---	---
Trichloroethene	---	---	0.0529	---	0.0363
Nonconventional Organics					
2-Butanone	---	4.68	---	17.4	3.23
2-Methylnaphthalene	0.0458	0.129	0.0100	0.116	0.0114
2-Propanone	1.21	7.42	---	13.6	1.54
4-Methyl-2-pentanone	0.0722	9.55	---	0.595	1.96
∝-Terpineol	0.0100	0.471	---	0.472	---
Benzoic Acid	---	---	---	1.58	---
Benzyl Alcohol	---	---	---	---	0.342
Hexanoic Acid	0.128	---	---	---	0.203
m-Xylene	0.366	---	0.104	0.595	0.241
n-Decane	0.279	1.26	0.0240	0.469	0.0873
n-Docosane	0.0347	0.110	0.0120	0.0232	0.0113

Table 7-1 (Continued)

Pollutant of Concern	Median LTA (mg/L)[1]				
	CEB-Heavy[2]	DAF-Heavy[3]	CP-Heavy[4]	DAF-All[5]	CP-All[6]
Nonconventional Organics (Continued)					
n-Dodecane	0.574	---	0.0100	0.195	1.46
n-Eicosane	0.0779	0.148	0.0382	0.0477	0.150
n-Hexacosane	0.0100	---	0.0122	0.0195	0.0144
n-Hexadecane	0.0417	0.489	0.0315	0.0842	0.0413
n-Octacosane	0.0100	---	0.0100	---	0.0168
n-Octadecane	0.0560	0.422	0.0100	0.0694	0.0308
n-Tetracosane	---	---	0.0329	0.0219	0.0121
n-Tetradecane	0.116	0.979	0.612	0.0754	0.0394
n-Triacontane	---	---	0.0341	0.0100	0.0138
o-&*p*-Xylene	0.359	---	0.0940	0.271	0.197
p-Cresol	---	---	---	---	---
p-Cymene	---	0.608	0.0208	0.0700	0.0100
Pentamethylbenzene	---	---	0.0100	---	---
Priority Metals and Elements					
Antimony	0.195	---	---	0.0800	---
Arsenic	---	---	---	---	---
Beryllium	---	---	---	---	---
Cadmium	0.132	---	0.00500	0.0161	0.00774
Chromium	0.153	0.0715	0.0147	0.0695	0.0463
Copper	0.437	1.45	0.534	0.478	0.270
Lead	0.914	0.237	0.0473	0.175	0.0993
Mercury	---	---	---	---	0.000329
Nickel	0.255	---	---	0.0544	0.0436
Selenium	---	---	---	0.0524	---
Silver	---	0.0846	---	---	---
Thallium	---	---	---	---	---
Zinc	6.78	0.903	0.0637	0.837	0.303
Nonconventional Metals and Elements					
Aluminum	6.33	1.34	0.0804	1.31	1.33
Barium	---	0.702	0.145	---	---
Boron	1.64	---	11.4	---	---
Cobalt	---	---	---	---	---
Iron	47.3	19.0	0.366	2.79	1.78
Manganese	0.596	0.884	0.00768	0.0340	0.0318
Molybdenum	0.205	---	0.774	0.119	0.275
Tin	---	---	---	0.0972	0.0495
Titanium	0.0818	0.0927	0.00453	0.0192	0.0461
Vanadium	---	---	---	---	---

Table 7-1 (Continued)

Pollutant of Concern	Median LTA (mg/L)[1]				
	CEB-Heavy[2]	DAF-Heavy[3]	CP-Heavy[4]	DAF-All[5]	CP-All[6]
Nonconventional Metals and Elements (Continued)					
Yttrium	---	---	---	---	---
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	2,460	3,320	2,510	998	1,270
Total Organic Carbon (TOC)	626	1610	910	326	310
Total Petroleum Hydrocarbon (measured as SGT-HEM)[7]	200	42.1	7.20	13.7	10.2

[1]LTAs for these pollutants of concern, for all options, were not calculated for one or more of the following reasons: the pollutant was not treated by the technology; the pollutant was detected below treatable concentrations in the wastewater influent; the pollutant was not detected in the influent wastewater; there was a process upset at the time samples were collected; the treatment performance data had inconsistent detection limits, or data considered a lower limit of the actual value. See Section 7.3 of this chapter for more details related to the data editing criteria.
[2]CEB-Heavy represents data from facilities using chemical emulsion breaking treatment of heavy wastewater.
[3]DAF-Heavy represents data from facilities using DAF treatment of heavy wastewater.
[4]CP-Heavy represents data from facilities using chemical precipitation treatment of heavy wastewater.
[5]DAF-All represents data from facilities using DAF treatment of all facility process wastewater.
[6]CP-All represents data from facilities using chemical precipitation treatment of all facility process wastewater.
[7]SGT-HEM is measured by Method 1664 (promulgated at 64 FR 26315; May 14, 1999). In this method, EPA defines SGT-HEM as non-polar material (NPM). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to SGT-HEM as total petroleum hydrocarbon (TPH).

HEM-Hexane Extractable Material.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

(TPH)[1] (as an overall indicator pollutant of effective control). Table 7-2 presents the selected pollutants of concern. The rationale for selecting these pollutants is discussed below.

7.5.1 Elimination of Treatment Chemicals

EPA eliminated aluminum and iron from the list of selected pollutants for candidate pretreatment standards development because aluminum and iron are commonly added to wastewater as treatment chemicals in the industrial laundries industry. Potential regulation of aluminum and iron could interfere with their beneficial use as wastewater treatment additives.

7.5.2 Elimination of Pollutants Not Treated or Below Treatable Concentrations

EPA eliminated pollutants from the list of pollutants of concern when they were not removed by the treatment technologies that were the bases for the technology options. EPA also eliminated pollutants when the pollutants were present below treatable concentrations in wastewater influent to the treatment systems, and therefore would not be substantially removed by the treatment technologies under consideration. For the purposes of this analysis, EPA used only influent data greater than 10 times the method detection level for each pollutant to reliably evaluate treatment effectiveness within the consistent operating range of the main treatment technologies considered.

EPA considered two main technologies as the bases for the regulatory options (see Chapter 8 of this document for a description of the regulatory options). The two technologies are chemical precipitation and DAF. Pollutants were not selected for candidate pretreatment standards development if they were not detected or were detected below treatable concentrations in either DAF or chemical precipitation influent wastewater. Table 7-3 presents these pollutants and the reasons the pollutants were eliminated.

7.5.3 Elimination of Pollutants that Do Not Pass Through or Otherwise Interfere with Publicly Owned Treatment Works (POTWs)

Section 307(b) of the Clean Water Act authorizes EPA to promulgate pretreatment standards for indirect dischargers to control pollutants that pass through, interfere with, or are incompatible with the operation of POTWs. Pollutants shown to pass through a POTW may be regulated by categorical pretreatment standards. This section presents a brief background of EPA's guidance and methods used for evaluating pass through, and the results of the pass-through evaluation.

[1]SGT-HEM is measured by Method 1664 (promulgated at 64 FR 26315; May 14, 1999). In this method, EPA defines SGT-HEM as non-polar material (NPM). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to SGT-HEM as total petroleum hydrocarbon (TPH).

Table 7-2

Selected Pollutants of Concern for Treatment Options Considered in Developing Long-Term Averages and Variability Factors

Pollutant
Priority Organics
Ethylbenzene
Tetrachloroethene
Nonconventional Organics
m-Xylene
o-&*p*-Xylene
Priority Metals
Copper
Zinc
Bulk Nonconventionals
Total Petroleum Hydrocarbon (measured as SGT-HEM)[1]

[1] SGT-HEM is measured by Method 1664 (promulgated at 64 FR 26315; May 14, 1999). In this method, EPA defines SGT-HEM as non-polar material (NPM). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to SGT-HEM as total petroleum hydrocarbon (TPH).

SGT-HEM - Silica Gel Treated-Hexane Extractable Material

Table 7-3

Pollutants Eliminated from Further Consideration From the Pass-Through Analysis Because They Are Not Treated or They Are Below Treatable Concentrations

Pollutant	Reason Excluded
Priority Organics	
1,2-Diphenylhydrazine	Pollutant not detected in CP and DAF influents.
4-Chloro-3-methylphenol	Pollutant detected below treatable concentrations in CP influent.
Butyl Benzyl Phthalate	Pollutant detected below treatable concentrations in DAF influent.
Chlorobenzene	Pollutant detected below treatable concentrations in CP influent.
Chloroform	Pollutant detected below treatable concentrations in CP influent.
Di-*n*-butyl Phthalate	Pollutant detected below treatable concentrations in CP influent.
Isophorone	Pollutant not detected in DAF influent.
Methylene Chloride	Pollutant detected below treatable concentrations in CP influent.
Phenol	Pollutant not treated by CP technology.
trans-1,2-Dichloroethene	Pollutant not detected in CP influent and pollutant not treated by DAF technology.
Trichloroethene	Pollutant not treated by DAF technology.
Nonconventional Organics	
∝ -Terpineol	Pollutant detected below treatable concentrations in CP influent.
Benzoic Acid	Pollutant not treated by CP technology.
Benzyl Alcohol	Pollutant not treated by DAF technology.
Hexanoic Acid	Pollutant not detected in DAF influent.
n-Octacosane	Pollutant detected below treatable concentrations in DAF influent.
p-Cresol	Pollutant not detected in CP influent and pollutant detected below treatable concentrations in DAF influent.
Pentamethylbenzene	Pollutant not detected in CP and DAF influents.
Priority Metals and Elements	
Antimony	Pollutant detected below treatable concentrations in CP influent.
Arsenic	Pollutant detected below treatable concentrations in CP and DAF influents.
Beryllium	Pollutant detected below treatable concentrations in CP influent and pollutant not detected in DAF influent.
Mercury	Pollutant detected below treatable concentrations in DAF influent.
Selenium	Pollutant detected below treatable concentrations in CP influent.
Silver	Pollutant detected below treatable concentrations in CP and DAF influents.
Thallium	Pollutant not detected in CP influent and pollutant detected below treatable concentrations in DAF influent.

Table 7-3 (Continued)

Pollutant	Reason Excluded
Nonconventional Metals and Elements	
Barium	Pollutant detected below treatable concentrations in CP and DAF influents.
Boron	Pollutant detected below treatable concentrations in CP and DAF influents.
Cobalt	Pollutant detected below treatable concentrations in CP and DAF influents.
Vanadium	Pollutant detected below treatable concentrations in CP and DAF influents.
Yttrium	Pollutant detected below treatable concentrations in CP and DAF influents.

Source: Industrial Laundries Treatment Performance Data.
CP - Chemical Precipitation
DAF - Dissolved Air Flotation

7.5.3.1 Background

To promulgate pretreatment standards for a specific industry, EPA examines whether the pollutants discharged by the industry pass through a POTW to waters of the U.S. or interfere with POTW operation or sludge disposal practices. Generally, in determining whether pollutants pass through a POTW, EPA compares the percentage of the pollutant removed by well-operated POTWs achieving secondary treatment with the percentage of the pollutant removed by candidate meeting best available technology (BAT) or pretreatment technology options.

For specific pollutants, such as volatile organic compounds or highly biodegradable compounds, EPA may use other means to determine if POTWs provide effective treatment. For volatile compounds, a volatile override test based on the Henry's Law Constant is used to determine pass through. For the volatile compounds that are also highly biodegradable, the pass-through determination may be conducted using engineering modeling, such as WATER8, to determine biodegradation rates representing POTW treatment.

For the industrial laundries industry, where only pretreatment standards are being considered (since EPA has not identified any direct dischargers) EPA compared the POTW pollutant removal efficiency with pollutant removal efficiencies estimated using the candidate PSES technology representing BAT factors. EPA finds that a pollutant passes through when the average removal efficiency achieved nationwide by well-operated POTWs (those meeting secondary treatment requirements) is less than the average removal efficiencies achieved by facilities meeting the candidate PSES for that pollutant, considering the factors listed in Sections 301 and 304 of the Clean Water Act.

For this final action, EPA determined that a pollutant that has a Henry's Law Constant greater than 1×10^{-5} atm-m^3/mol will be sufficiently volatile such that a significant portion of the compound would not be treated by the POTW because a significant portion of the compound volatilizes to the air. EPA further determined the extent to which pollutants are degraded at POTWs. For such volatile compounds, EPA determined POTW percent removal based on the POTW removal model for the pollutant with the most similar Henry's Law Constant, as presented in the Development Document for the Pharmaceutical Manufacturing Industry Effluent Limitations Guidelines and Standards (63 FR 50388) using a combination of POTW empirical data and the WATER8 biodegradation model as described in Section 7.5.4.7 of this chapter.

EPA eliminated three conventional pollutants, biochemical oxygen demand (BOD_5), total suspended solids (TSS), and oil and grease (measured as HEM), from consideration for the pass-through analysis without conducting the percent removal comparison because POTWs are designed to treat these parameters. EPA does not consider these three conventional pollutants to pass through. EPA also eliminated TPH (measured as SGT-HEM) from consideration, because instead of examining TPH, EPA conducted a pass-through analysis of the individual compounds (*n*-alkanes and several others) that were found to compose TPH from the EPA Method 1664 Characterization Study data. For the pass-through analysis, EPA

evaluated 39 pollutants from the list of 72 pollutants of concern. Tables 7-4 and 7-5 present the POTW removals used in the pass-through analysis. The following sections present the methodology and results from the pass-through analysis performed for both chemical precipitation and DAF candidate pretreatment technology options.

7.5.3.2 Methodology for Determining Treatment Technology Percent Removals

Industrial laundry wastewater treatment performance data for chemical precipitation and dissolved air flotation were obtained during the industrial laundries sampling program. EPA obtained influent and effluent data from two chemical precipitation facilities and from two DAF facilities. EPA used these data to determine whether a pollutant passes through a POTW. For conducting the pass-through analysis, EPA edited the data as described in Section 7.3 of this chapter for calculating the long-term average concentrations. This editing included excluding influent and the corresponding effluent data that were associated with treatment or process upsets, excluding data for pollutants that were never detected in influents to treatment systems, excluding data for pollutants not treated by the treatment technology, and excluding data with influent concentrations less than 10 times the method detection level. Using these editing criteria allowed for the possibility that low percent removals reflected low influent concentrations, not poor treatment technology performance.

After editing the data, EPA used the following methodology to calculate a percent removal:

1) The remaining influent data and effluent data for a sampled facility were averaged for each pollutant, to give an average influent concentration and an average effluent concentration for each pollutant.

2) EPA calculated percent removals from the average influent and average effluent concentrations for each pollutant for a sampled facility using the following equation:

$$\text{Percent Removal} = \frac{\text{Influent}_{avg} - \text{Effluent}_{avg}}{\text{Influent}_{avg}} \times 100$$

3) EPA calculated the median percent removal for each pollutant for each technology from the facility-specific percent removals.

7.5.3.3 Methodology for Determining POTW Percent Removals

The primary source of the POTW percent removals data was the Fate of Priority Pollutants in Publicly Owned Treatment Works (50 POTW Study) (2). However, the 50 POTW Study did not contain data for all pollutants for which the pass-through analysis was to be performed. Therefore, EPA obtained additional data from the Risk Reduction Engineering Laboratory (RREL) Treatability Database (3). Biodegradation data estimated using WATER8 were obtained from the Final POTW Pass-Through Analysis for the Pharmaceutical Manufacturing Point Source Category (4). Additional information on these sources is presented

Table 7-4

Comparison of the Chemical Precipitation Treatment Technology and POTW Percent Removals for the Industrial Laundries Pass-Through Analysis

Pollutant	(Median) Chemical Precipitation Percent Removal	(Median) Percent POTW Removal	Source of POTW Removals	Chemical Precipitation Removal Greater than POTW Removal?	Henry's Law Constant Greater than $1.0x10^{-5}$ atm-m^3/mol?	Pass Through?
Bulk Nonconventionals						
Chemical Oxygen Demand (COD)	88	82	50 POTW (10XDL)	Yes	NA	Yes
Total Organic Carbon (TOC)	45	71	50 POTW (10XDL)	No	NA	No
Priority Organics						
1,1,1-Trichloroethane	35	24	WATER8	Yes	Yes	Yes
Bis(2-ethylhexyl) Phthalate	98	60	50 POTW (10XDL)	Yes	No	Yes
Di-*n*-octyl Phthalate	94	33	WATER8	Yes	Yes	Yes
Ethylbenzene	69	33	WATER8	Yes	Yes	Yes
Naphthalene	88	18	WATER8	Yes	Yes	Yes
Tetrachloroethene	85	33	WATER8	Yes	Yes	Yes
Toluene	45	33	WATER8	Yes	Yes	Yes
Nonconventional Organics						
2-Butanone	8	18	WATER8	No	Yes	No
2-Methylnaphthalene	96	28	RREL 5 (All WW)	Yes	No	Yes
2-Propanone	15	85	WATER8	No	Yes	No
4-Methyl-2-pentanone	21	18	WATER8	Yes	Yes	Yes
n-Decane	98	33	WATER8	Yes	Yes	Yes
n-Docosane	96	94	Generic Removal	Yes	No	Yes
n-Dodecane	84	33	WATER8	Yes	Yes	Yes

Table 7-4 (Continued)

Pollutant	(Median) Chemical Precipitation Percent Removal	(Median) Percent POTW Removal	Source of POTW Removals	Chemical Precipitation Removal Greater than POTW Removal?	Henry's Law Constant Greater than $1.0x10^{-5}$ atm-m^3/mol?	Pass Through?
Nonconventional Organics (Continued)						
n-Eicosane	98	33	WATER8	Yes	Yes	Yes
n-Hexacosane	92	94	Generic Removal	No	No	No
n-Hexadecane	98	33	WATER8	Yes	Yes	Yes
n-Octadecane	94	33	WATER8	Yes	Yes	Yes
n-Tetracosane	98	94	Generic Removal	Yes	No	Yes
n-Tetradecane	98	33	WATER8	Yes	Yes	Yes
n-Triacontane	91	94	Generic Removal	No	No	No
m-Xylene	80	33	WATER8	Yes	Yes	Yes
o-&*p*-Xylene	71	33	WATER8	Yes	Yes	Yes
p-Cymene[1]	92	99	RREL5 (All WW)	No	NA	No
Priority Metals and Elements						
Cadmium	94	91	50 POTW (10XDL)	Yes	NA	Yes
Chromium	93	91	50 POTW (10XDL)	Yes	NA	Yes
Copper	94	84	50 POTW (10XDL)	Yes	NA	Yes
Lead	96	92	50 POTW (10XDL)	Yes	NA	Yes
Nickel	97	52	50 POTW (10XDL)	Yes	NA	Yes
Zinc	96	77	50 POTW (10XDL)	Yes	NA	Yes

Table 7-4 (Continued)

Pollutant	(Median) Chemical Precipitation Percent Removal	(Median) Percent POTW Removal	Source of POTW Removals	Chemical Precipitation Removal Greater than POTW Removal?	Henry's Law Constant Greater than 1.0×10^{-5} atm-m^3/mol?	Pass Through?
Nonconventional Metals and Elements						
Manganese	97	41	RREL5 (All WW)	Yes	NA	Yes
Molybdenum	46	52	RREL5 (Dom WW)	No	NA	No
Tin	92	65	RREL5 (All WW)	Yes	NA	Yes
Titanium	90	69	RREL5 (All WW)	Yes	NA	Yes

[1]Henry's Law Constant data were not available for this pollutant.
WATER8 - Percent biodegradation calculated because pollutant has a Henry's Law Constant greater than 1.0×10^{-5} atm-m^3/mol.
50 POTW (10XDL) - 50 POTW Study, using 10 times the method detection level editing criterion.
RREL5 (All WW) - RREL Treatability Database Version 5.0, using domestic and industrial wastewater editing criterion.
RREL5 (Dom WW) - RREL Treatability Database Version 5.0, using domestic wastewater editing criterion.
Generic Removal - Based on reported POTW removal values for two n-alkanes, *n*-Dodecane and *n*-Eicosane.
NA - Not applicable.

Table 7-5

Comparison of the DAF Treatment Technology and POTW Percent Removals for the Industrial Laundries Pass-Through Analysis

Pollutant	(Median) DAF Percent Removal	(Median) Percent POTW Removal	Source of POTW Removals	DAF Removal Greater than POTW Removal?	Henrys Law Constant Greater than $1.0x10^{-5}$ atm-m^3/mol?	Pass Through?
Bulk Nonconventionals						
Chemical Oxygen Demand (COD)	82	82	50 POTW (10XDL)	No	NA	No
Total Organic Carbon (TOC)	66	71	50 POTW (10XDL)	No	NA	No
Priority Organics						
1,1,1-Trichloroethane	75	24	WATER8	Yes	Yes	Yes
Bis(2-ethylhexyl) Phthalate	>99	60	50 POTW (10XDL)	Yes	No	Yes
Di-*n*-octyl Phthalate	91	33	WATER8	Yes	Yes	Yes
Ethylbenzene	94	33	WATER8	Yes	Yes	Yes
Naphthalene	93	18	WATER8	Yes	Yes	Yes
Tetrachloroethene	74	33	WATER8	Yes	Yes	Yes
Toluene	48	33	WATER8	Yes	Yes	Yes
Nonconventional Organics						
2-Butanone	29	18	WATER8	Yes	Yes	Yes
2-Methylnaphthalene	97	28	RREL 5 (All WW)	Yes	No	Yes
2-Propanone	36	85	WATER8	No	Yes	No
4-Methyl-2-pentanone	48	18	WATER8	Yes	Yes	Yes
n-Decane	99	33	WATER8	Yes	Yes	Yes
n-Docosane	91	94	Generic Removal	No	No	No
n-Dodecane	99	33	WATER8	Yes	Yes	Yes
n-Eicosane	98	33	WATER8	Yes	Yes	Yes

Table 7-5 (Continued)

Pollutant	(Median) DAF Percent Removal	(Median) Percent POTW Removal	Source of POTW Removals	DAF Removal Greater than POTW Removal?	Henrys Law Constant Greater than $1.0x10^{-5}$ atm-m^3/mol?	Pass Through?
Nonconventional Organics (Continued)						
n-Hexacosane	98	94	Generic Removal	Yes	No	Yes
n-Hexadecane	99	33	WATER8	Yes	Yes	Yes
n-Octadecane	97	33	WATER8	Yes	Yes	Yes
n-Tetracosane	98	94	Generic Removal	Yes	No	Yes
n-Tetradecane	98	33	WATER8	Yes	Yes	Yes
n-Triacontane	94	94	Generic Removal	No	No	No
m-Xylene	95	33	WATER8	Yes	Yes	Yes
o-&*p*-Xylene	66	33	WATER8	Yes	Yes	Yes
p-Cymene[1]	94	99	RREL5 (All WW)	No	NA	No
Priority Metals and Elements						
Cadmium	87	91	50 POTW (10XDL)	No	NA	No
Chromium	92	91	50 POTW (10XDL)	Yes	NA	Yes
Copper	91	84	50 POTW (10XDL)	Yes	NA	Yes
Lead	92	92	50 POTW (10XDL)	No	NA	No
Nickel	87	52	50 POTW (10XDL)	Yes	NA	Yes
Zinc	90	77	50 POTW (10XDL)	Yes	NA	Yes

Table 7-5 (Continued)

Pollutant	(Median) DAF Percent Removal	(Median) Percent POTW Removal	Source of POTW Removals	DAF Removal Greater than POTW Removal?	Henrys Law Constant Greater than $1.0x10^{-5}$ atm-m^3/mol?	Pass Through?
Nonconventional Metals and Elements						
Manganese	92	41	RREL5 (All WW)	Yes	NA	Yes
Molybdenum	52	52	RREL5 (Dom WW)	No	NA	No
Tin	73	65	RREL5 (All WW)	Yes	NA	Yes
Titanium	93	69	RREL5 (All WW)	Yes	NA	Yes

[1]Henry's Law Constant data were not available for this pollutant.
WATER8 - Percent biodegradation calculated because pollutant has a Henry's Law Constant greater than 1.0×10^{-5} atm-m^3/mol.
50 POTW (10XDL) - 50 POTW Study, using 10 times the method detection level editing criterion.
RREL5 (All WW) - RREL Treatability Database Version 5.0, using domestic and industrial wastewater editing criterion.
RREL5 (Dom WW) - RREL Treatability Database Version 5.0, using domestic wastewater editing criterion.

Generic Removal - Based on reported POTW removal values for two n-alkanes, *n*-Dodecane and *n*-Eicosane.
NA - Not applicable.

below. EPA gave these data sources the following priority in determining the percentage removal of pollutants by POTWs nationwide:

1) 50 POTW Study;
2) RREL Treatability Database; and
3) Generic pollutant group removal.

7.5.3.4 50 POTW Study

EPA edited the 50 POTW Study data to eliminate influent and the corresponding effluent data where the average influent concentration at a POTW was less than 10 times the method detection level, to allow for the possibility that low percent removals reflected low influent concentrations, not POTW treatment technology performance. EPA used the method detection levels reported at the time of the 50 POTW Study to edit the data.

In cases where no data remained after conducting the ten times the method detection level edit, EPA used less stringent editing criteria. In these cases, influent data and the corresponding effluent data were eliminated where the influent concentrations were less than 20 µg/L or less than the method detection level for pollutants where the method detection level is greater than 20 µg/L. EPA selected 20 µg/L because, for pollutants with low influent concentrations (i.e., less than 20 µg/L or the method detection limit), the effluent concentrations were consistently below the method detection level and could not be precisely quantified.

After editing the POTW data, EPA used the following methodology to calculate POTW percent removal:

1) The remaining influent data and effluent data for each POTW were averaged for each pollutant to give an average influent concentration and an average effluent concentration for each pollutant. EPA determined that the minimum concentration at which a pollutant can be accurately measured is the method detection level. Therefore, if the average effluent concentration was less than the method detection level, EPA set the average effluent concentration to the method detection level before calculating the average effluent concentration.

2) Percent removals were calculated from the average influent and average effluent concentrations for each pollutant for the POTW using the equation in Section 7.5.3.2 of this document.

3) The median percent removal was calculated for each pollutant from the POTW-specific percent removals.

7.5.3.5 RREL Treatability Database

If the POTW percent removal for a pollutant could not be calculated using the 50 POTW Study data, EPA used data from the RREL Treatability Database to determine the POTW

percent removal. Because individual influent/effluent pairs were not provided in the database, the data-editing criteria used for the 50 POTW Study could not be used. EPA edited the RREL Treatability Database using the following criteria:

1) Only data pertaining to domestic wastewater were used, unless there were less than three data points available.

2) If there were less than three data points available using the domestic wastewater edit, a combination of domestic wastewater and industrial wastewater data was used.

3) Only full-scale and pilot-scale data were used; bench-scale data were not used.

4) Only data from a peer-reviewed journal, a government report, or a government database were used. However, data from the 50 POTW Study (a government report) reported in the RREL Treatability Database were not used. These data points were not used because if the RREL Treatability Database was being examined, it meant that the data for a pollutant did not meet the editing criteria for the 50 POTW Study, as outlined above.

5) Only data from treatment technologies representing secondary treatment of wastewater were used. These technologies included activated sludge, aerated lagoon, sedimentation followed by activated sludge, and activated sludge followed by activated sludge treatment.

After applying these editing criteria, EPA calculated percent removals for each data source for each pollutant, using the equation in Section 7.5.3.2 of this document. EPA then took the median of the percent removals for each pollutant to obtain a median POTW percent removal from the RREL Treatability Database.

7.5.3.6 Generic Removal

After the editing of the 50 POTW Study and RREL Treatability Database, data for some of the *n*-alkanes were still not available. In order to determine an appropriate POTW percent removal for these pollutants, the available data for the 72 pollutants of concern were reviewed. EPA determined that one source of POTW removal data for specific *n*-alkanes would be the generic group removal of the *n*-alkanes for which data were available. Table 7-6 presents this source of *n*-alkanes removal data which were used to calculate the percent removal for

specific *n*-alkanes without POTW percent removal data. The percent removal for *n*-decane in this database was excluded from this analysis because it reported only a minimum percent removal. The generic percent removal of 94 percent was obtained from *n*-dodecane and *n*-eicosane. This percentage removal was transferred to four other alkanes, *n*-docosane, *n*-hexacosane, *n*-tetracosane, and *n*-triacontane. Because the *n*-dodecane and *n*-eicosane were

Table 7-6

Generic Removal for *n*-Alkanes

Pollutant	POTW Removal (%)	Source of Data
n-Decane	> 9[1]	RREL Treatability Database - Domestic and Industrial Wastewater Edit
n-Dodecane	95	RREL Treatability Database - Domestic and Industrial Wastewater Edit
n-Eicosane	92	RREL Treatability Database - Domestic and Industrial Wastewater Edit
Average Group Removal	**94**	

[1]The POTW percent removal for *n*-decane was not used in calculating the average group removal because the removal represents a reported minimum value only; the actual removal may be between nine and >99 percent.

subsequently determined to be volatile organic compounds (see Section 7.5.3.7 below), and therefore POTW removal for them did not represent POTW removal for nonvolatile *n*-alkanes. EPA estimated POTW removal for the nonvolatile *n*-alkanes based on the 74 percent removal of TPH discussed in the NODA. Since the four alkanes using the transferred removals were determined to be non-volatile alkanes, and were identified as constituents of TPH, a POTW removal of greater than 74 percent was identified, based on the removal of TPH in comments to the proposal. Thus, the removal of the four alkanes were evaluated based on a removal range of 74 to 94 percent. A comparison of the differences in pollutant removals (in pounds and toxic weighted pounds) based on the two removal rates is shown in Table 7-7. These results show very minimal changes (less than one percent in pounds; only one toxic pound equivalent) in the loadings. The magnitude of these changes would not affect the overall decision that no national regulation is warranted.

7.5.3.7 Biodegradation Rates for Volatile Organics

EPA's pass-through analysis for industrial laundries included a volatility analysis. At proposal, pollutants that had a Henry's Law Constant greater than 2.4×10^{-5} atm-m^3/mol were determined to volatilize prior to reaching the POTW and therefore were considered to pass through the POTW. No credit was given for the biodegradation of these compounds and the POTW percent removal was set to zero. Based on comments and additional data gathered by EPA through other rulemaking activities, EPA determined that a portion of all the volatile compounds is biodegraded at the POTWs. In addition, EPA determined for the final action that pollutants with Henry's Law Constants greater than 1×10^{-5} atm-m^3/mol are considered volatile.

The primary source of the biodegradation data is based on the methodology incorporating empirical data with WATER8 modeling results for primary and secondary treatment at a POTW. During the Pharmaceuticals Manufacturing Point Source Category Effluent Limitations, Guidelines, and Standards rulemaking (63 FR 50388) data concerning volatility and biodegradation were gathered for seven pollutants; four of these pollutants overlapped with pollutants of concern for the industrial laundries (chloroform, 2-propanone[2], methylene chloride, and toluene). EPA also obtained data for three additional pollutants (methanol, ethanol, and isopropanol). These data were based on pharmaceutical sampling data and modeling information to determine the overall percent biodegradation for these pollutants.

EPA adopted this analysis approach in the pharmaceuticals rulemaking and for the industrial laundries final action in order to be consistent with the MACT standards which consider water soluble compounds less likely to volatilize than compounds that are partially soluble. The following data sources were used in this analysis:

- EPA and Pharmaceutical Research and Manufacturers Association (PhRMA) wastewater samples collected from the primary treatment works at the Barceloneta POTW in Barceloneta, Puerto Rico;

[2]For the pharmaceuticals manufacturing point source category, 2-propanone was referred to as acetone.

Table 7-7

POTW Pollutant Removals Based on a Revised POTW Removal Efficiency for Nonvolatile *n*-Alkanes[1] (Entire Industry - No Cutoff)

Pollutant group	Pollutant Removal with 94%	Pollutant Removal with 74%	Toxic Weighted Pollutant Removal with 94%	Toxic Weighted Pollutant Removal with 74%
DAF-IL				
Total Nonconventional Organics[2]	519,692	529,450	2,248	2,249
Total Pollutants[3]	857,876	867,633	35,245	35,245
CP-IL				
Total Nonconventional Organics[3]	528,732	538,808	2,321	2,321
Total Pollutants[3]	894,618	904,695	42,917	42,918

[1]Pollutants that changed percent removal from 94% to 74% include *n*-docosane, *n*-hexacosane, *n*-tetracosane, *n*-triacontane.
[2]The nonconventional organic group is the only pollutant group where the pollutant removal changed.
[3]The total does not include bulk conventionals and bulk nonconventionals.

- WATER8 air emissions modeling of the Barceloneta POTW;
- A pharmaceutical industry submitted literature study evaluating volatilization potential in sewers; and
- A pharmaceutical industry submitted study evaluating volatilization potential in an enclosed equalization tank.

EPA and PhRMA conducted sampling at the Barceloneta POTW to obtain data on the removal of several volatile organic compounds (chloroform, methylene chloride, 2-propanone, and toluene) and certain alcohols (methanol, ethanol, and isopropanol) in the primary treatment works of a POTW. The Barceloneta POTW was selected for sampling because the influent wastewater to this POTW was known to contain measurable quantities of VOCs and alcohols and other pollutants for which pharmaceutical industries pretreatment standards were proposed in May 1995.

Samples were collected in the influent and effluent from treatment units. Percent loss across the treatment units was calculated from the influent and effluent mass from the unit. Percent losses were assumed to be due to two major fate pathways: biodegradation and volatilization. Knowing the overall percentage loss and the loss estimated to be attributed to biodegradation (both aerobic and anoxic), EPA estimated the percent of loss attributed to volatilization. The sampling results shown in Table 7-8 indicate the range of percent loss of alcohols in the primary treatment units due to volatilization.

In addition, EPA performed WATER8 air emissions modeling of the Barceloneta POTW using the sampled pollutant influent concentrations in order to obtain an estimate of how much volatilization of volatile organic pollutants occurs throughout the entire POTW system. The results of the modeling study shown in Table 7-9 show less volatilization in the primary treatment portion than the measured data from the Barceloneta POTW sampling episode suggests.

EPA also evaluated an industry submitted study evaluating sewer losses for water soluble compounds. The results of this study indicate that volatilization of methanol and ethanol in closed sewers is expected to be minimal with maximum emission rates of 0.03 and 0.19 percent being projected under most sewer conditions, respectively. However, under open sewer conditions, volatilization percentages of methanol and ethanol could be as high as 6.5 and 20 percent, respectively.

Based on these biodegradation rates, EPA determined that the POTWs do treat volatile pollutants to some degree. These percent removals were transferred to the industrial laundries pollutants of concern based on an analysis of Henry's Law Constants. Pollutants with similar constants were assigned the same overall percent biodegradation rate.

Table 7-10 presents the industrial laundries pollutants of concern that were found to volatilize, their respective Henry's Law Constants, their assigned overall percent biodegradation, and the data source for the percent biodegradation.

Table 7-8

EPA and PhRMA Sampling Results for Primary Treatment at Barceloneta POTW Data from Method 1671

Pollutant	1996 Primary Treatment Data (Aerated Grit Chamber and Primary Clarifier) Percent Loss	1996 Primary Clarifier Only Data Percent Loss
Methanol	19.1	8.1
Ethanol	25.3	15.2
Isopropanol	11.4	5.9
Chloroform	44.2	45.6
Toluene	29.0	22.4
Methylene	27.8	20.8
2-Propanone	10.3	14.7

Table 7-9

WATER8 Modeling Results for Primary and Secondary Treatment at Barceloneta Wastewater Treatment Plant

Pollutant	Percent Volatilization in Primary %	Percent Biodegradation in Primary %	Percent Volatilization in Secondary %	Percent Biodegradation in Secondary %	Percent Overall Volatilization %	Percent Overall Biodegradation %
Methanol	2.1	0.0	2.0	90.8	4.0	90.5
Ethanol	2.2	0.0	0.5	97.7	2.7	92.9
Isopropanol	4.2	0.0	10.8	74.0	14.3	77.0
2-Propanone[1]	8.0	0.0	3.2	94.9	10.7	84.8
Chloroform	40.9	0.0	58.7	40.5	71.2	23.9
Methylene Chloride	38.9	0.0	70.4	28.6	78.2	17.8
Toluene	46.1	0.0	36.9	62.7	60.4	32.4

[1]2-Propanone was referred to as acetone in the PhRMA data.
Note: Volatilization and biodegradation percentages may not add up to 100% since some of the compound remains in the effluent and some goes out with the sludge.

Table 7-10

Percent Biodegradation for Industrial Laundries Pollutants of Concern Found to Be Volatile

Analyte	Henry's Law Constant	Overall Percent Biodegradation	Data Source for Percent Biodegradation
1,1,1-Trichloroethane	3.67×10^{-3}	24	Transferred from chloroform.
2-Propanone	2.10×10^{-5}	85	Pharms pass-through analysis[1]
Di-n-Octyl Phthalate	1.37×10^{-1}	33	Transferred from toluene.
Ethylbenzene	8.44×10^{-3}	33	Transferred from toluene.
Naphthalene	4.83×10^{-4}	18	Transferred from methylene chloride.
Tetrachlorethene	1.56×10^{-2}	33	Transferred from toluene.
Toluene	5.90×10^{-3}	33	Pharms pass-through analysis[1]
2-Butanone	2.70×10^{-5}	18	Transferred from methylene chloride.
4-Methyl-2-Pentanone	4.95×10^{-5}	18	Transferred from methylene chloride.
n-Decane	6.90	33	Transferred from toluene.
n-Dodecane	7.40	33	Transferred from toluene.
n-Eicosane	1.5×10^{-3}	33	Transferred from toluene.
n-Hexadecane	1.28×10^{-1}	33	Transferred from toluene.
n-Octadecane	1.44×10^{-2}	33	Transferred from toluene.
n-Tetradecane	7.14×10^{-1}	33	Transferred from toluene.
m-Xylene[2]	7.00×10^{-3}	33	Transferred from toluene.
o&p-Xylene[2]	7.00×10^{-3}	33	Transferred from toluene.
$\propto$ -Terpineol	6.09×10^{-5}	18	Transferred from methylene chloride.

[1]Based on the Final POTW Pass-Through Analysis for the Pharmaceutical Manufacturing Point Source Category (4) (WATER8 Modeling Results for Primary and Secondary Treatment at Barceloneta Wastewater Treatment Plant).
[2]Henry's Law Constant provided for total xylenes.

7.5.3.8 Results of the POTW Pass-Through Analysis

Tables 7-4 and 7-5 present a comparison of the treatment technology percent removal with the POTW percent removal for chemical precipitation and DAF, respectively. If the treatment technology percent removal is greater than the POTW percent removal, the pollutant is considered to pass through the POTW. A pollutant with a Henry's Law Constant greater than 1×10^{-5} atm-m^3/mol was determined to pass through if its percent biodegradation was less than the removal obtained by the treatment technology. For chemical precipitation, 31 of the 39 pollutants analyzed passed through. For DAF, 29 of the 39 pollutants analyzed passed through.

7.5.4 Pollutants of Concern Selected for Candidate Pretreatment Standards Development

Based on the results of the pass-through analysis, EPA considered the pollutants shown in Table 7-11 as pollutants for candidate pretreatment standards development for the chemical precipitation and DAF technologies. To further streamline permitting and monitoring requirements, EPA considered using regulating "indicator" pollutants to control a broader set of pollutants. Because many of the pollutants originate from similar sources and have similar treatability properties, EPA concluded that indicator pollutants are appropriate for controlling discharges from industrial laundries to POTWs. In selecting indicator pollutants to reflect control of a broader set of pollutants, EPA chose pollutants that were detected most frequently, detected in the higher concentrations, and are most toxic. The following paragraphs describe the rationale for selecting the pollutants for regulation.

EPA considered three bulk parameters, TPH (measured as SGT-HEM), TOC, and COD, for candidate pretreatment standards development. EPA believes that controlling one bulk parameter in industrial laundries wastewater is sufficient to ensure the appropriate level of control of the effluent from industrial laundries. TPH is a measure of the mineral oil fraction of carbon-containing compounds and mineral oils are treated less effectively by POTWs than many other carbon-containing compounds; therefore, EPA has selected TPH for regulation. Because TPH measures a variety of organic compounds, as demonstrated by the EPA Method 1664 Characterization Study, it can also serve as an indicator pollutant for other organic pollutants shown on Table 7-11.

EPA is not specifically controlling the following ten straight chain alkane (*n*-alkanes) pollutants or two semivolatile compounds because EPA's TPH study indicated that these pollutants comprise a portion of TPH, measured as SGT-HEM, and thus would be controlled by EPA's regulation of TPH:

- *n*-Decane;
- *n*-Docosane;
- *n*-Dodecane;
- *n*-Eicosane;
- *n*-Hexacosane;
- *n*-Hexadecane;

Table 7-11

Pollutants Considered for Regulation for Chemical Precipitation and DAF after the Pass-Through Analysis

Pollutant	Passes Through for Chemical Precipitation	Passes Through for DAF
Bulk Nonconventionals		
Chemical Oxygen Demand (COD)	X	
Total Organic Carbon (TOC)		
Total Petroleum Hydrocarbon (TPH)[1]	---	---
Priority Organics		
1,1,1-Trichloroethane	X	X
Bis(2-ethylhexyl) Phthalate	X	X
Di-*n*-octyl Phthalate	X	X
Ethylbenzene	X	X
Naphthalene	X	X
Tetrachloroethene	X	X
Toluene	X	X
Nonconventional Organics		
2-Butanone		X
2-Methylnaphthalene	X	X
2-Propanone		
4-Methyl-2-pentanone	X	X
n-Decane	X	X
n-Docosane	X	
n-Dodecane	X	X
n-Eicosane	X	X
n-Hexacosane		X
n-Hexadecane	X	X
n-Octadecane	X	X
n-Tetracosane	X	X
n-Tetradecane	X	X
n-Triacontane		
m-Xylene	X	X
o-&*p*-Xylene	X	X
p-Cymene		

Pollutant	Passes Through for Chemical Precipitation	Passes Through for DAF
Priority Metals and Elements		
Cadmium	X	
Chromium	X	X
Copper	X	X
Lead	X	
Nickel	X	X
Zinc	X	X
Nonconventional Metals and Elements		
Manganese	X	X
Molybdenum		
Tin	X	X
Titanium	X	X

[1]TPH was considered for regulation, although a pass-through analysis was not performed for this pollutant (a pass-through analysis was performed on the individual compounds that compose TPH).

- *n*-Octadecane;
- *n*-Tetracosane;
- *n*-Tetradecane;
- *n*-Triacontane;
- Bis (2-ethylhexyl) Phthalate; and
- Naphthalene.

EPA also believes that controlling TPH will also control the remaining semivolatile organic pollutants shown on Table 7-11.

EPA believes that controlling the following volatile organic pollutants will control the remaining volatile organic pollutants shown on Table 7-11 to some extent. However, the most effective way to treat items containing solvents, which contain these volatile organic compound, is to pretreat the items prior to the water washing process.

- Ethylbenzene;
- Tetrachloroethene;
- *m*-Xylene; and
- *o*-&*p*-Xylene.

These pollutants represent a cross-section of chlorinated and aromatic compounds that are the majority of the volatile pollutants on Table 7-11.

EPA believes that controlling the following metal pollutants that pass through will control the remaining metal and elemental pollutants on Table 7-11:

- Copper; and
- Zinc.

These metals were selected because the minimum solubilities of their associated metal hydroxides span a pH range sufficient to control the other pollutants within this pH range. Most metals will be treated by chemical precipitation or DAF within this range. These metals were also selected because they were detected most frequently (in nearly 100 percent of untreated wastewater samples) and in the highest concentrations.

7.6 Long-Term Average and Variability Factors for the Five Technology Options

EPA collected analytical sampling data for the purpose of evaluating treatment performance of several technology options. The data were collected from the following three sources:

1. The EPA wastewater sampling effort;
2. The self-monitoring data submitted by the facilities in response to the detailed monitoring questionnaire; and
3. Other industry-supplied data.

EPA used all of the data representative of well-designed and well-operated treatment systems to calculate long-term averages and variability factors for facilities with Chemical Emulsion Breaking (CEB), Dissolved Air Flotation of heavy wastewater (DAF-Heavy), Dissolved Air Flotation of all process wastewater (DAF-All), Chemical Precipitation of heavy wastewater (CP-Heavy), and Chemical Precipitation of all process wastewater (CP-All). EPA applied the data-editing procedures described in Section 7.3. The long-term averages and variability factors can be used to calculate local limits based on best engineering judgement.

EPA calculated the long-term average of a pollutant for each facility based on either an arithmetic average or the expected value of the distribution of the samples, depending on the number of total samples and the number of detected samples for the pollutant at that facility.

EPA calculated variability factors by fitting a statistical distribution to the data. The distribution was based on an assumption that the furthest excursion from the LTA that a well-operated facility using the given technology could be expected to make on a daily basis was a point below which 99% of the data for that facility falls, under the assumed distribution. The daily variability factor (1-day VF) for each pollutant at each facility is the ratio of the estimated 99^{th} percentile of the distribution of the daily pollutant concentration values divided by the expected value of the distribution of the daily values.

EPA also calculated 4-day variability factors based on an assumption that the furthest excursion from the LTA that a well-operated facility using the given technology could be expected to make on a monthly basis was a point below which 95 percent of the data for that facility falls, under the assumed distribution. The 4-day variability for each pollutant at each facility is the ratio of the estimated 95^{th} percentile of the distribution of monthly pollutant concentration values divided by the expected value of the distribution of the monthly values. (The monthly values were based on an assumed monitoring frequency of 4 times per month.)

By accounting for these reasonable excursions above the LTA, EPA's use of variability factors results in standards that are generally well above the actual LTAs. Thus if a facility operates its treatment system to meet the relevant LTA, EPA expects the facility to be able to meet the standards. Variability factors assure that normal fluctuations in a facility's treatment are accounted for in the standards.

The methodology used for calculating candidate pretreatment standards for industrial laundries consists of a daily maximum for all pollutants and an additional monthly average for TPH . The daily maximum limitation was the product of the pollutant long-term average and the pollutant 1-day variability factor. The monthly average limitation (for pollutants assumed to be monitored 4 times per month) was a product of the pollutant long-term average and the pollutant 4-day variability factor. The pollutant long-term average and the pollutant variability factor were both defined as the median of all of the well-operated facilities using that treatment technology.

For a more complete description of the data review, data aggregation, and the estimation of the long-term averages and variability factors under the modified delta-lognormal model, please refer to Appendix D.

In Tables 7-12 to 7-16 below, we present facility-level statistics for each of the five treatment technologies for the following eight pollutants: TPH (measured as SGT-HEM or non-polar material), ethylbenzene, tetrachloroethene, *m*-xylene, *o*-&*p*-xylene, copper, lead, and zinc. These same statistics can be found for all 72 pollutants of concern in Appendix D.

These tables provide influent and effluent information for individual facilities as well as a median value for long-term averages and variability factors for all facilities of that treatment type for each of the eight pollutants. No additional data have been added to the record since the Notice of Data Availability (NODA); therefore, this is the same data used to calculate the pretreatment standards in the public record at the time EPA published the NODA (DCN L14000). The only change reflected in the Tables 7-12 to 7-16 is the elimination of toluene based on the lack of data demonstrating effective treatment by the DAF or CP technology, and the elimination of naphthalene and bis(2-ethylhexyl)phthalate because they comprise a portion of TPH (measured as SGT-HEM).

7.7 Mass-Based Standards

EPA considered mass-based standards for the industrial laundries industry. A mass-based standard is the product of the concentration-based standards and a wastewater flow rate divided by a production rate. Mass-based standards require information about flow and production both to set the standards and to enforce them, but have the advantage of encouraging flow reduction. Two methodologies were considered for developing mass-based standards. One methodology bases the mass-based standards on an average number of gallons of wastewater discharged per pound of laundry washed for the total wastewater flow and total production from facilities. The other methodology bases the standards on an average number of gallons of water used per pound of laundry washed calculated from individual item data. EPA used annual data provided in the detailed questionnaire to evaluate these approaches.

Based on total wastewater flow and total production, EPA identified the seventy-fifth percentile and the ninetieth percentile production-normalized flows as potentially appropriate for calculating mass-based standards. The seventy-fifth percentile production-normalized flow is 3.13 gallons of wastewater per pound of production and the ninetieth percentile production normalized flow is 4.06 gallons of wastewater per pound of production. However, EPA found no strong relationship between gallons of wastewater used per pound of laundry and items washed, total production, or the amount of recycle/reuse that could be used as a basis for developing mass-based standards. Therefore, EPA decided not to develop mass-based candidate pretreatment standards for the industrial laundries industry.

Table 7-12

Chemical Emulsion Breaking (CEB)

Analyte	Episode	Inf # Obs	Inf# ND	Inf Est. LTA (mg/l)	Eff # Obs	Eff# ND	Eff Est. LTA (mg/l)	Eff 1-Day VF	Eff 4-Day VF
Copper	S1	5	0	4.4	4	0	0.44	1.76	1.23
Ethylbenzene	S1	5	0	0.87	4	0	0.31	4.74	1.91
Lead	S1	5	0	2.49	4	0	0.91	1.32	1.1
m-Xylene	S1	5	0	2.52	4	0	0.37	1.61	1.19
o-&*p*-Xylene	S1	5	0	2.59	4	0	0.36	1.72	1.22
Tetrachloroethene	S1	5	1	3.3	4	0	0.29	2.91	1.51
Total Petroleum Hydrocarbon (as SGT-HEM)	S1	5	0	3090	4	0	200	3.51	1.64
Zinc	S1	5	0	8.71	4	0	6.78	1.33	1.11

Inf # Obs - The total number of influent samples.
Inf # ND - The total number of nondetected values in the influent.
Inf Est. LTA - The estimated influent long-term average.
Eff # Obs - The total number of effluent samples.
Eff # ND - The total number of nondetected values in the effluent.
Eff Est. LTA - The estimated effluent long-term average.
Eff 1-day VF - The estimated 1-day effluent variability factor.
Eff 4-day VF - The estimated 4-day effluent variability factor.

Table 7-13

Dissolved Air Flotation - Heavy (DAF-Heavy)

Analyte	Episode	Inf# Obs	Inf # ND	Inf Est. LTA (mg/l)	Eff # Obs	Eff # ND	Eff Est. LTA (mg/l)	Eff 1-Day VF	Eff 4-Day VF
Copper	S2	5	0	8.03	4	0	1.45	1.9	1.27
Ethylbenzene	Q10	NA	NA	NA	9	0	1.18	2.59	1.43
	S2	5	0	5.82	4	1	1.56	2.86	1.48
	Median	NA	NA	5.82	.	.	1.37	2.73	1.46
Lead	Q10	NA	NA	NA	9	0	0.11	2.69	1.46
	S2	5	0	1.83	4	0	0.36	6.18	2.23
	Median	NA	NA	1.83	.	.	0.24	4.43	1.84
Tetrachloroethene	Q10	NA	NA	NA	4	3	0.14	.	.
Total Petroleum Hydrocarbon (as SGT-HEM)	S2	5	0	263	4	0	42.1	2.31	1.37
Zinc	S2	5	0	6.45	4	0	0.9	2.68	1.45

Inf # Obs - The total number of influent samples.
Inf # ND - The total number of nondetected values in the influent.
Inf Est. LTA - The estimated influent long-term average.
Eff # Obs - The total number of effluent samples.
Eff # ND - The total number of nondetected values in the effluent.
Eff Est. LTA - The estimated effluent long-term average.
Eff 1-day VF - The estimated 1-day effluent variability factor.
Eff 4-day VF - The estimated 4-day effluent variability factor.

Table 7-14

Chemical Precipitation - Heavy (CP-Heavy)

Analyte	Episode	Inf # Obs	Inf # ND	Inf Est. LTA (mg/l)	Eff # Obs	Eff # ND	Eff Est. LTA (mg/l)	Eff 1-Day VF	Eff 4-Day VF
Copper	S3	5	0	3.42	5	0	0.53	4.06	1.76
Ethylbenzene	S3	5	1	0.96	5	1	0.09	4.37	1.8
Lead	S3	5	0	1.55	5	4	0.05	.	.
m-Xylene	S3	5	0	1.36	5	1	0.1	2.66	1.42
o-&*p*-Xylene	S3	5	0	1.24	5	0	0.09	3.63	1.67
Tetrachloroethene	S3	4	0	2.06	5	2	0.13	4.48	1.9
Total Petroleum Hydrocarbon (as SGT-HEM)	S3	5	0	2330	5	4	7.2	.	.
Zinc	S3	5	0	9.03	5	0	0.06	6.19	2.23

Inf # Obs - The total number of influent samples.
Inf # ND - The total number of nondetected values in the influent.
Inf Est. LTA - The estimated influent long-term average.
Eff # Obs - The total number of effluent samples.
Eff # ND - The total number of nondetected values in the effluent.
Eff Est. LTA - The estimated effluent long-term average.
Eff 1-day VF - The estimated 1-day effluent variability factor.
Eff 4-day VF - The estimated 4-day effluent variability factor.

Table 7-15

Dissolved Air Flotation - All (DAF-All)

Analyte	Episode	Inf # Obs	I nf # ND	Inf Est. LTA (mg/l)	Eff # Obs	Eff # ND	Eff Est. LTA (mg/l)	Eff 1-Day VF	Eff 4-Day VF
Copper	Q1	NA	NA	NA	15	0	0.67	6.4	2.28
	Q2	NA	NA	NA	13	1	0.59	4.52	1.87
	Q3	NA	NA	NA	5	0	0.57	6.95	2.4
	Q4	NA	NA	NA	8	0	0.39	3.15	1.56
	S4	5	0	3.4	5	0	0.36	3.07	1.54
	S5	5	0	2.14	5	0	0.17	1.59	1.18
	Median	NA	NA	2.77	.	.	0.48	3.83	1.72
Ethylbenzene	Q2	NA	NA	NA	13	10	0	3.54	1.9
	S5	5	0	7.05	5	0	0.37	4.16	1.78
	Median	NA	NA	7.05	.	.	0.19	3.85	1.84
Lead	Q1	NA	NA	NA	15	1	0.22	5.05	1.99
	Q2	NA	NA	NA	14	3	0.23	2.99	1.57
	Q3	NA	NA	NA	4	2	0.32	1.55	1.47
	Q4	NA	NA	NA	8	8	0.1	.	.
	S4	5	0	1.46	5	2	0.14	3.72	1.75
	S5	5	0	0.76	5	2	0.06	1.39	1.13
	Median	NA	NA	1.11	.	.	0.18	2.99	1.57
m-Xylene	S5	5	0	16.1	5	0	0.6	3.55	1.65
o-&p-Xylene	S4	5	0	0.18	5	0	0.12	3.15	1.56
	S5	5	0	11.8	5	0	0.42	4.07	1.76
	Median	NA	NA	5.99	.	.	0.27	3.61	1.66
Tetrachloroethene	Q1	NA	NA	NA	6	2	25.1	15.4	3.87
	Q2	NA	NA	NA	13	4	0.02	4.97	2
	S4	5	0	0.14	5	0	0.07	3.08	1.54
	S5	5	1	9.58	5	0	0.43	5.87	2.16
	Median	NA	NA	4.86	.	.	0.25	5.42	2.08

Table 7-15 (Continued)

Analyte	Episode	Inf # Obs	I nf # ND	Inf Est. LTA (mg/l)	Eff # Obs	Eff # ND	Eff Est. LTA (mg/l)	Eff 1-Day VF	Eff 4-Day VF
Total Petroleum Hydrocarbon (as SGT-HEM)	S4	5	0	318	5	1	11.4	3.64	1.68
	S5	5	0	683	5	0	16	2.62	1.44
	Median	NA	NA	500	.	.	13.7	3.13	1.56
Zinc	Q1	NA	NA	NA	15	0	0.9	7.34	2.49
	Q2	NA	NA	NA	12	0	1.22	5.11	1.99
	Q3	NA	NA	NA	5	0	0.91	6.27	2.25
	Q4	NA	NA	NA	8	0	0.78	2.96	1.52
	S4	5	0	4.69	5	0	0.51	3.17	1.57
	S5	5	0	3.07	5	0	0.27	1.58	1.18
	Median	NA	NA	3.88	.	.	0.84	4.14	1.78

Inf # Obs - The total number of influent samples.
Inf # ND - The total number of nondetected values in the influent.
Inf Est. LTA - The estimated influent long-term average.
Eff # Obs - The total number of effluent samples.
Eff # ND - The total number of nondetected values in the effluent.
Eff Est. LTA - The estimated effluent long-term average.
Eff 1-day VF - The estimated 1-day effluent variability factor.
Eff 4-day VF - The estimated 4-day effluent variability factor.

Table 7-16

Chemical Precipitation - All (CP-All)

Analyte	Episode	Inf # Obs	Inf # ND	Inf Est. LTA (mg/l)	Eff # Obs	Eff # ND	Eff Est. LTA (mg/l)	Eff 1-Day VF	Eff 4-Day VF
Copper	Q5	NA	NA	NA	16	0	0.14	1.71	1.22
	Q6	NA	NA	NA	7	0	0.4	1.56	1.17
	S6	5	0	3.13	4	0	0.06	3.57	1.65
	S7	5	0	4.85	5	0	0.44	2.37	1.38
	Median	NA	NA	3.99	.	.	0.27	2.04	1.3
Ethylbenzene	Q7	NA	NA	NA	3	1	0.04	.	.
	Q9	NA	NA	NA	4	0	0.34	9.68	3.05
	S6	5	1	0.51	4	0	0.27	2.47	1.41
	S7	5	0	0.31	5	0	0.04	2.72	1.46
	Median	NA	NA	0.41	.	.	0.15	2.72	1.46
Lead	Q5	NA	NA	NA	16	11	0.1	1.29	1.07
	Q6	NA	NA	NA	7	0	0.28	1.52	1.16
	Q7	NA	NA	NA	11	5	0.03	3.89	1.77
	Q8	NA	NA	NA	4	1	0.2	2.66	1.55
	S6	5	0	1.5	4	2	0.06	5.29	2
	S7	5	0	2.14	5	0	0.1	5.22	2.02
	Median	NA	NA	1.82	.	.	0.1	3.27	1.66
m-Xylene	S6	5	1	4.39	4	1	0.35	3.84	1.83
	S7	5	0	0.75	5	0	0.14	1.89	1.26
	Median	NA	NA	2.57	.	.	0.24	2.87	1.54
o-&*p*-Xylene	S6	5	2	2.88	4	1	0.23	4.12	1.87
	S7	5	0	0.9	5	0	0.16	1.92	1.27
	Median	NA	NA	1.89	.	.	0.2	3.02	1.57
Tetrachloroethene	Q9	NA	NA	NA	4	0	0.08	7.56	2.55
	S6	5	1	1.68	4	0	0.44	5.65	2.11
	S7	5	0	5.13	5	0	0.42	2.1	1.32
	Median	NA	NA	3.4	.	.	0.42	5.65	2.11

Table 7-16 (Continued)

Analyte	Episode	Inf # Obs	Inf # ND	Inf Est. LTA (mg/l)	Eff # Obs	Eff # ND	Eff Est. LTA (mg/l)	Eff 1-Day VF	Eff 4-Day VF
Total Petroleum Hydrocarbon (as SGT-HEM)	S6	5	0	164	4	0	10.8	2.54	1.42
	S7	5	0	991	5	0	9.51	1.76	1.23
	Median	NA	NA	578	.	.	10.2	2.15	1.32
Zinc	Q5	NA	NA	NA	16	0	0.1	3.96	1.74
	Q6	NA	NA	NA	7	0	1.72	2.14	1.33
	Q8	NA	NA	NA	4	0	0.3	6.94	2.4
	S6	5	0	3.71	4	0	0.05	1.79	1.24
	S7	5	0	8.45	5	0	0.52	3.08	1.54
	Median	NA	NA	6.08	.	.	0.3	3.08	1.54

Inf # Obs - The total number of influent samples.
Inf # ND - The total number of nondetected values in the influent.
Inf Est. LTA - The estimated influent long-term average.
Eff # Obs - The total number of effluent samples.
Eff # ND - The total number of nondetected values in the effluent.
Eff Est. LTA - The estimated effluent long-term average.
Eff 1-day VF - The estimated 1-day effluent variability factor.
Eff 4-day VF - The estimated 4-day effluent variability factor.

7.8 References

1. U.S. Environmental Protection Agency. Statistical Support Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category. EPA 821-R-97-006, Washington, DC, November 1997.

2. U.S. Environmental Protection Agency. Fate of Priority Pollutants in Publicly Owned Treatment Works (50 POTW Study). EPA-440/1-82/303. Washington, DC, September 1982.

3. U.S. Environmental Protection Agency. The Risk Reduction Engineering Laboratory (RREL) Treatability Database. Version 5.0., Cincinnati, OH.

4. U.S. Environmental Protection Agency. Final POTW Pass-Through Analysis for the Pharmaceutical Manufacturing Point Source Category.

CHAPTER 8
DEVELOPMENT OF TECHNOLOGY CONTROL OPTIONS

8.1 Introduction

This chapter presents the regulatory options considered by EPA as the basis for the candidate Pretreatment Standards for Existing Sources (PSES) and Pretreatment Standards for New Sources (PSNS) for the industrial laundries industry. This chapter presents the following information:

- Section 8.2 presents the initial technology control options considered as the bases for the candidate PSES and PSNS;
- Section 8.3 discusses the inclusion of pollution prevention in the technology control options;
- Section 8.4 discusses the exclusion of wastewater recycling activities from the technology control options;
- Section 8.5 presents the subcategorization analysis of the industrial laundries industry;
- Section 8.6 presents initial technology control options considered but rejected before the final action;
- Section 8.7 presents additional technology control options considered;
- Section 8.8 presents technology control options eliminated from further consideration;
- Section 8.9 presents regulatory control options considered for the final action; and
- Section 8.10 presents the references used.

8.2 Initial Technology Control Options Considered

EPA considered the same set of technology control options as potential bases for both PSES and PSNS. As described in Chapter 7, EPA had data available for three major postlaundering wastewater treatment technologies used at industrial laundries. As described in Chapter 6, EPA had data available for one prelaundering treatment technology used by industrial laundries, along with general information on pollution prevention activities at industrial laundries. The data for the postlaundering treatment technologies represented five different treatment options. These five different postlaundering treatment options and the one prelaundering treatment technology, in addition to the general application of the pollution prevention activities, formed the basis for EPA's six initial technology control options considered for the proposed rule.

The following sections further discuss each of these initial technology control options.

Table 8-1 summarizes the six initial technology control options and the number of detailed questionnaire facilities that have equivalent or better treatment currently in place.

8.2.1 Postlaundering Wastewater Treatment Technology Control Options

The five initial postlaundering wastewater treatment technology control options considered by EPA are:

- CEB-Heavy -- chemical emulsion breaking treatment of heavy wastewater;
- DAF-Heavy -- dissolved air flotation (DAF) treatment of heavy wastewater;
- CP-Heavy -- chemical precipitation treatment of heavy wastewater;
- DAF-All -- DAF treatment of all facility process wastewater; and
- CP-All -- chemical precipitation treatment of all facility process wastewater.

The treatment train for each of the postlaundering wastewater treatment technology control options includes the major wastewater treatment technology (i.e., chemical emulsion breaking, DAF, or chemical precipitation), as well as other ancillary equipment. Based on responses to the 1994 Industrial Laundries Industry Questionnaire (detailed questionnaire) and EPA site visits to industrial laundries, EPA assumed that every facility has an initial catch basin in which gravity settling occurs. Each option includes screening and equalization followed by the major wastewater treatment technology. Although they do not directly impact final effluent concentrations, screening and equalization are included in the technology control options because they are necessary to remove solids and control fluctuations in the process wastewater flow, respectively. They were also reported in the detailed questionnaire by most facilities that currently treat their wastewater. Based on information obtained through site visits, EPA determined that these technologies ensure proper operation of subsequent treatment technologies. The options in which DAF and chemical precipitation are used also include dewatering of the sludge generated.

Based on detailed questionnaire and sampling data from industrial laundries that use chemical emulsion breaking and chemical precipitation, as well as information on facilities' local discharge limits, EPA expects that the pH of the treated wastewater streams from these

Table 8-1

Technology Control Options Initially Considered for the Industrial Laundries Proposed Rule

Technology Control Option	Description	Basis of Standards[1]	Number of Facilities with Equivalent Treatment In Place[2]
CEB-Heavy	Chemical emulsion breaking of heavy wastewater	CEB-Heavy	5
DAF-Heavy	Dissolved air flotation of heavy wastewater	DAF-Heavy	2
CP-Heavy	Chemical precipitation of heavy wastewater	CP-Heavy	6[3]
DAF-All	Dissolved air flotation of all facility process wastewater	DAF-All	33
CP-All	Chemical precipitation of all facility process wastewater	CP-All	17[4]
OC-Only	Organics control (steam tumbling) of heavy industrial textile items	OC-Only	0[5]

[1]Pollutant concentration data representing each treatment option is presented in Chapter 7 of this document.
[2]Data obtained from 190 in-scope facilities that responded to the detailed questionnaire. In-scope facilities are those that meet the definition of an industrial laundry as presented in Chapter 4.
[3]One of these facilities operates a microfiltration unit to treat a portion of its process wastewater. Since microfiltration, when operated properly, can achieve lower final effluent pollutant concentrations than chemical precipitation (1), this facility is considered to have better treatment in place than the CP-Heavy option.
[4]One of these facilities operates an ultrafiltration unit to treat all of its process wastewater. Since ultrafiltration, when operated properly, can achieve lower final effluent concentrations than chemical precipitation (1), this facility is considered to have better treatment in place than the CP-All option.
[5]Data from one facility were available for OC-Only, but this facility steam tumbles printer towels/rags only, not all heavy industrial textile items.

technologies will be outside of facilities' locally permitted discharge range. Therefore, the CEB and chemical precipitation options also include pH adjustment of the final effluent prior to discharge. Technology control options in which a portion of the facility's wastewater is treated with CEB or chemical precipitation also include combining the treated and untreated streams prior to final pH adjustment and discharge. The effluent from DAF is expected to be within facilities' locally permitted discharge range for pH, because most facilities operating DAF adjust the pH to within a range acceptable for discharge, based on detailed questionnaire and sampling data. Therefore, the DAF treatment options do not include final pH adjustment. Technology control options in which a portion of the facility's wastewater is treated with DAF also include combining the treated and untreated streams prior to discharge.

The five initial wastewater treatment technology control options treat either the wastewater generated from washing "heavy" industrial laundry items only (i.e., those items with a relatively high pollutant load) or the total facility process wastewater. EPA modeled the raw wastewater treated in each option by considering the total raw wastewater flow reported by each facility in the detailed questionnaire to consist of three streams, as follows:

- Heavy industrial;
- Light industrial; and
- Nonindustrial.

The heavy industrial stream includes wastewater generated from water washing the following items:

- Shop towels;
- Printer towels/rags;
- Mops;
- Fender covers; and
- Filters.

The light industrial stream includes wastewater generated from water washing the following items:

- Industrial garments;
- Floor mats;
- Laundry bags; and
- Buffing pads;

and wastewater generated from dry cleaning followed by water washing or dual-phase washing of the following items:

- Industrial garments;
- Shop towels;
- Printer towels/rags;
- Mats;
- Mops;

- Fender covers;
- Laundry bags;
- Filters; and
- Buffing pads.

The nonindustrial stream includes wastewater generated from water washing or denim prewashing the following items (dry cleaning followed by water washing and dual-phase washing were not reported for nonindustrial textile items):

- Linen supply garments;
- Linen flatwork/full dry;
- Health-care items;
- Continuous roll towels;
- Clean room garments;
- Family laundry;
- New items;
- Executive wear; and
- Miscellaneous not our goods (items not owned by the laundry).

The wastewater generated from the washing of heavy industrial textile items ("heavy" wastewater) contains higher concentrations of most pollutants than the wastewater generated from the washing of light industrial and nonindustrial textile items ("light" wastewater). Figures 8-1, 8-2, and 8-3 illustrate the CEB-Heavy, DAF-Heavy, and CP-Heavy technology options, respectively. Only heavy wastewater is treated in these options. Figures 8-4 and 8-5 illustrate the DAF-All and CP-All technology options, respectively. Total facility process wastewater is treated in these options.

EPA obtained specific performance data on the treatment of heavy industrial laundry wastewater through wastewater sampling at industrial laundries, as discussed in Chapter 7 of this document. Estimated performance of the heavy options is based on pollutant concentrations obtained from the treated heavy wastewater, prior to combining with the light wastewater stream, as shown in Figures 8-1, 8-2, and 8-3. Figures 8-1 through 8-3 also show options discussed in Section 8.7 of this document. Estimated performance of the options treating total facility wastewater is based on pollutant concentrations obtained at the point of discharge from treatment of the entire wastewater stream, as shown in Figures 8-4 and 8-5.

8.2.2 Prelaundering Organics Control (OC-Only) Technology Control Option

The Prelaundering Organics Control (OC-Only) option, shown in Figure 8-6, consists of steam tumbling treatment of facilities' heavy industrial laundry items to remove organics prior to water washing of the items. EPA obtained data from one facility that could be used to estimate the performance of steam tumbling of printer towels/rags; these data are

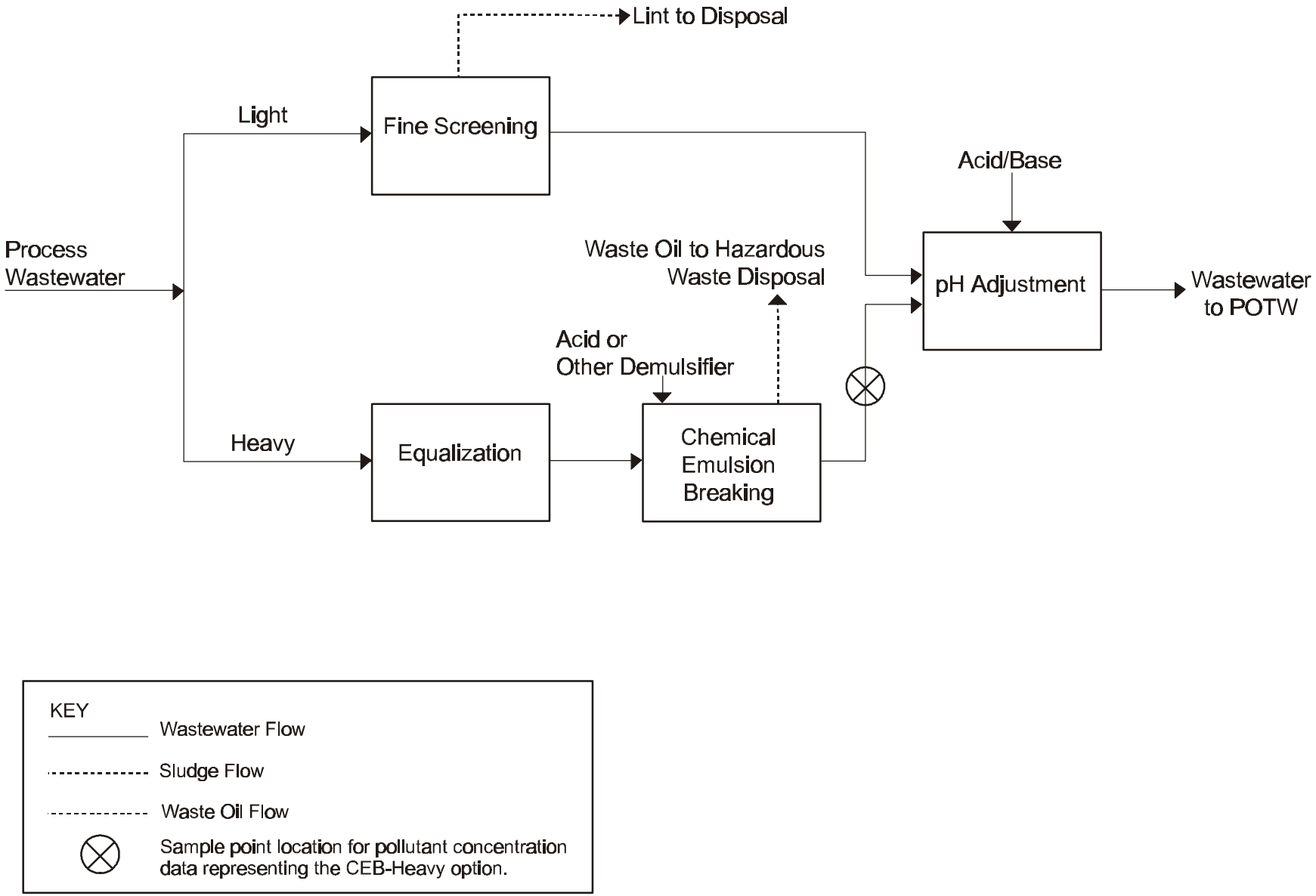

Figure 8-1. CEB-Heavy Option: Chemical Emulsion Breaking of Heavy Industrial Laundry Wastewater

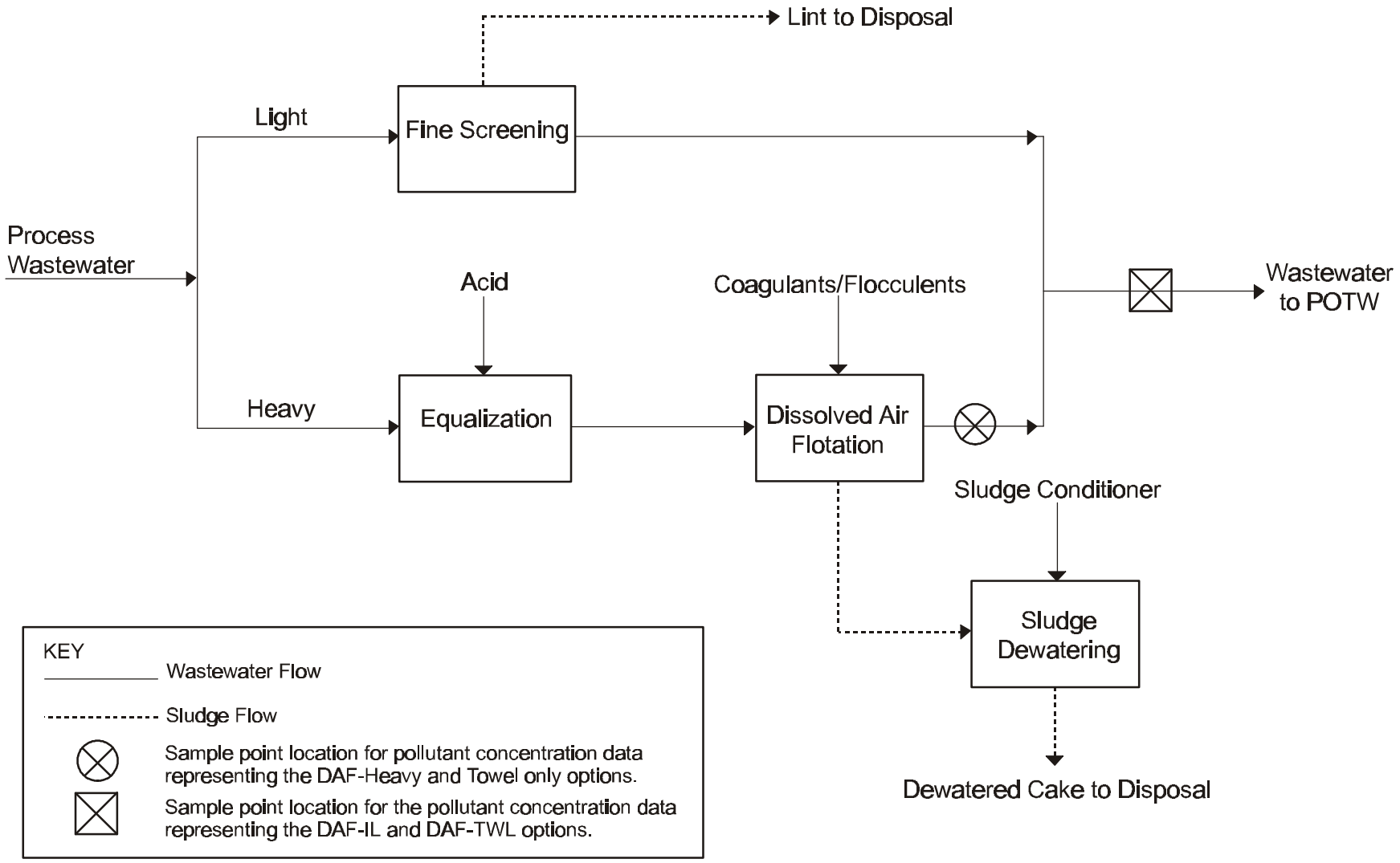

Figure 8-2. DAF-Heavy, DAF-IL, DAF-TWL, and Towel Only Options: Dissolved Air Flotation of a Portion of a Facility's Process Wastewater

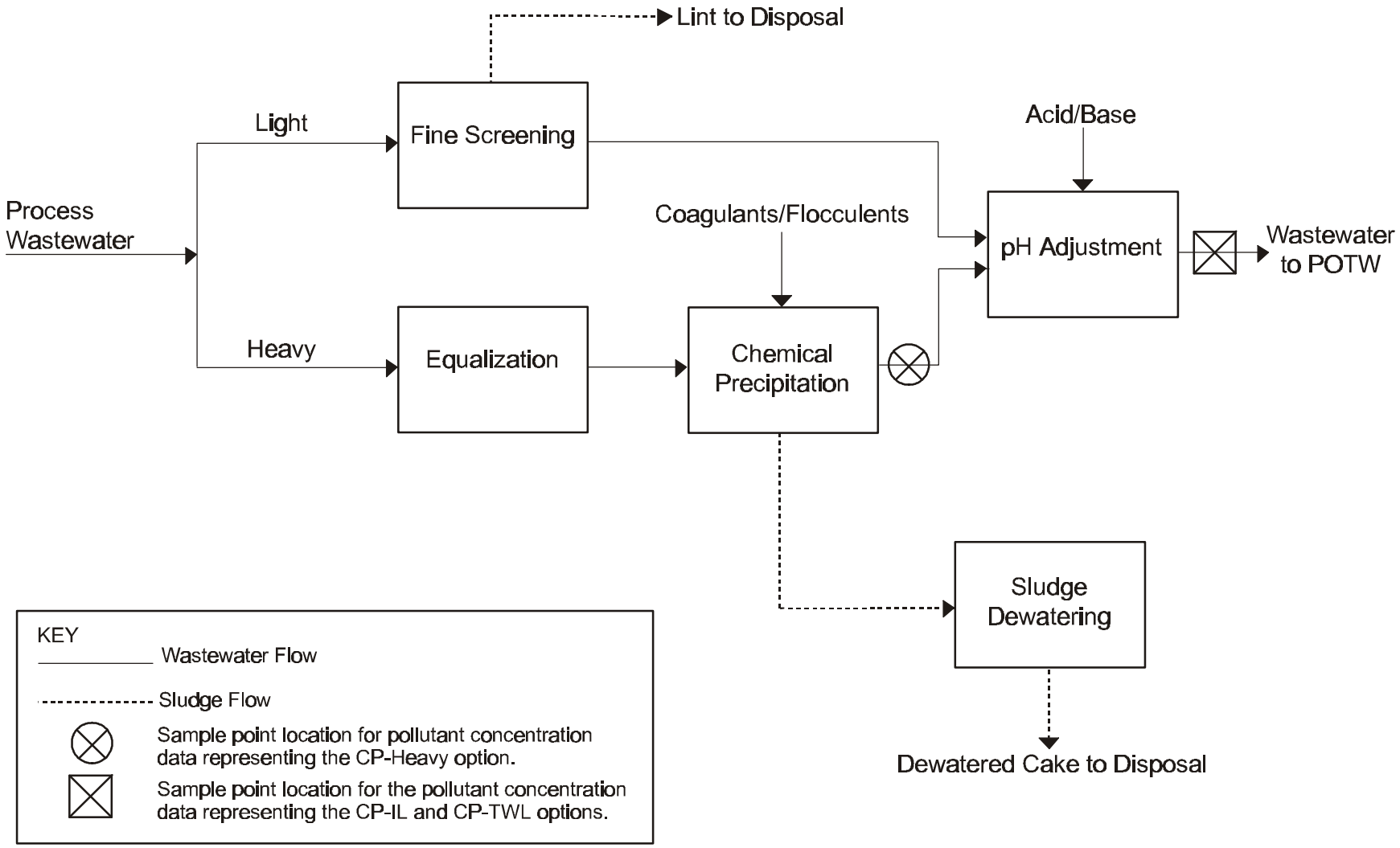

Figure 8-3. CP-Heavy, CP-IL, and CP-TWL Options: Chemical Precipitation of a Portion of a Facility's Process Wastewater

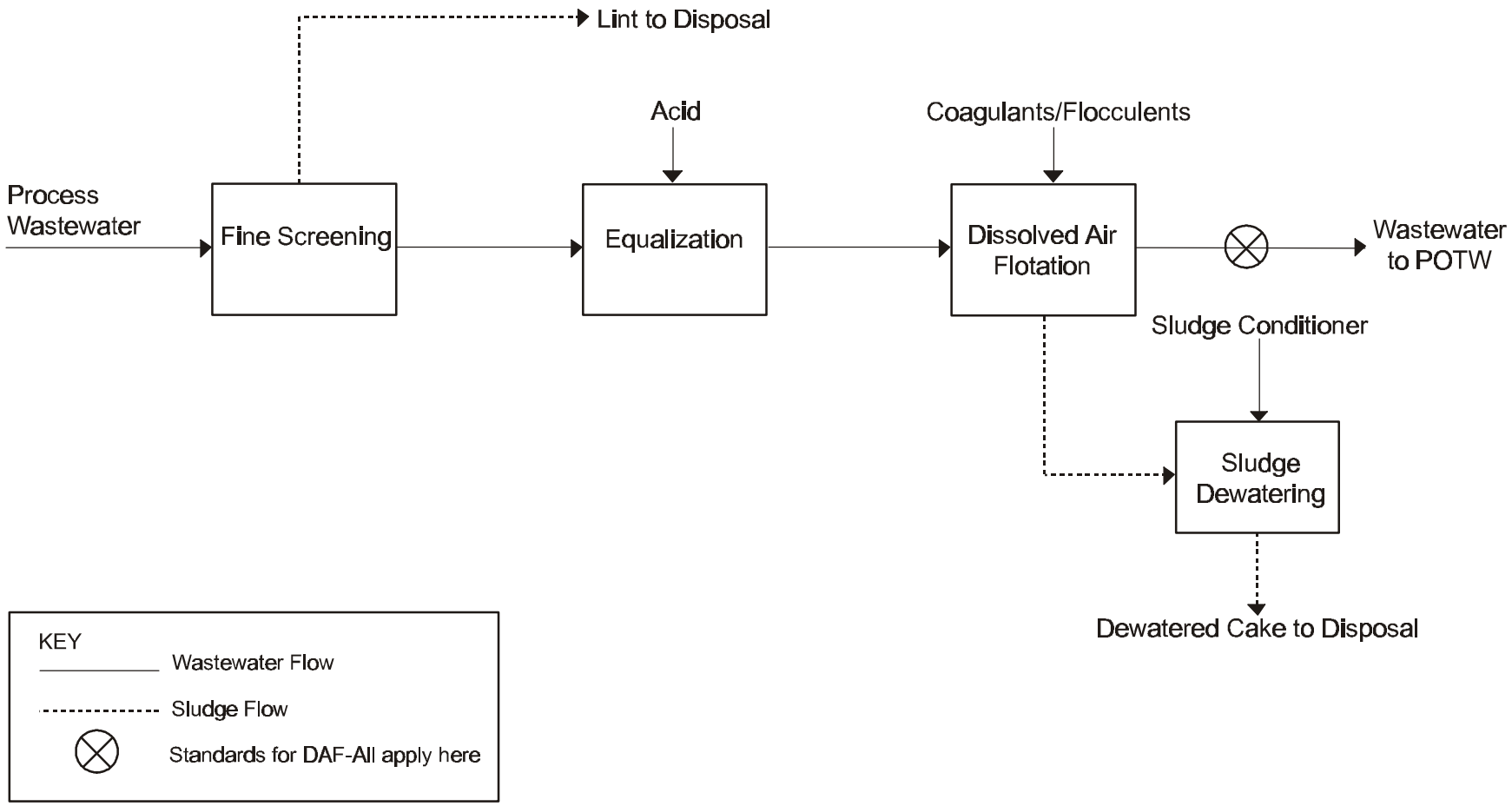

Figure 8-4. DAF-All Option: Dissolved Air Flotation of Total Facility Process Wastewater

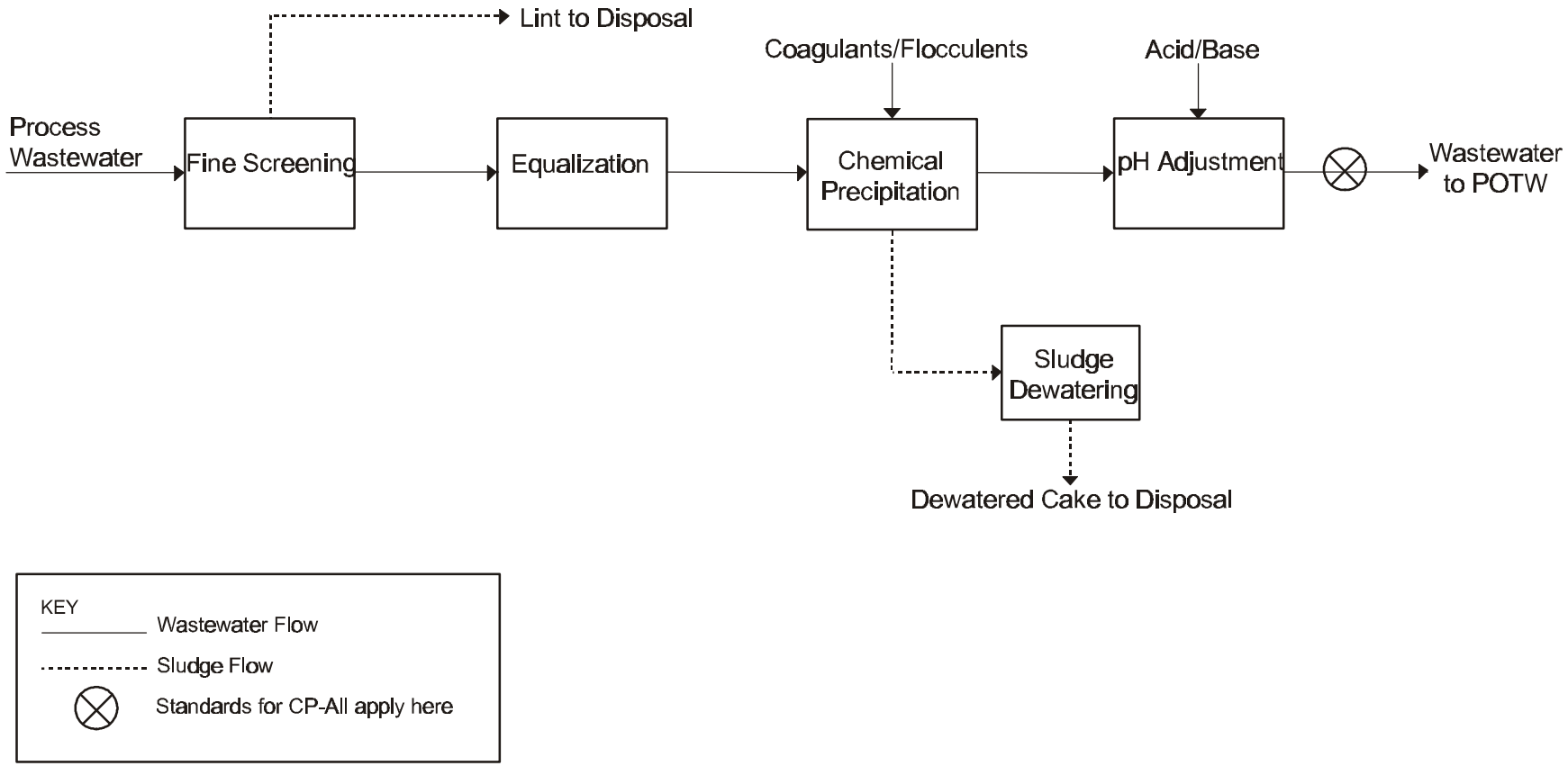

Figure 8-5. CP-All Option: Chemical Precipitation of Total Facility Process Wastewater

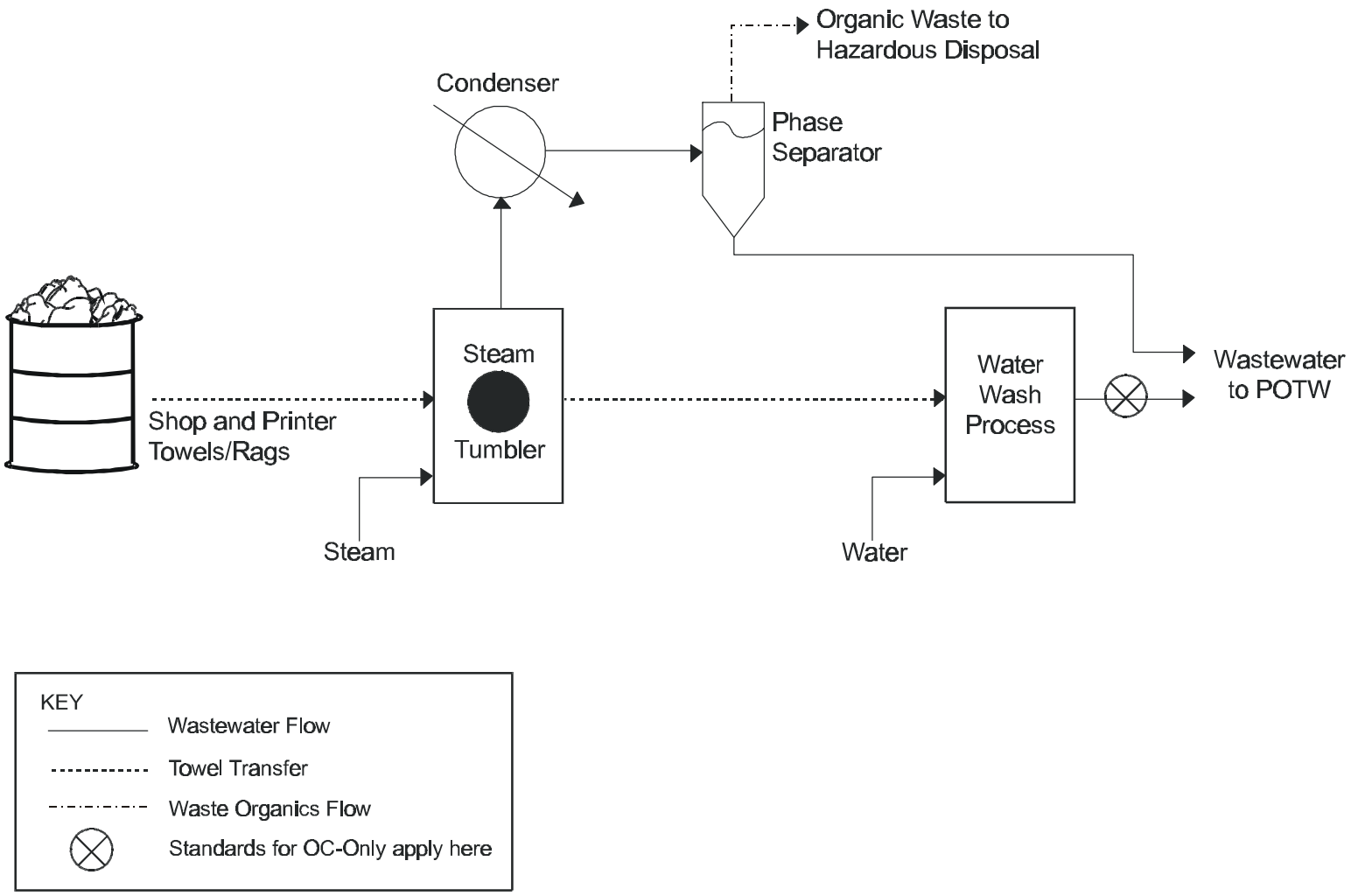

Figure 8-6. OC-Only Option: Prelaundering Organics Control

presented in Chapter 6. The standards for the OC-Only option would be based on pollutant concentrations obtained from the raw wastewater discharged from a load of steam-tumbled printer towels/rags, as shown in Figure 8-6.

8.3 Inclusion of Pollution Prevention in the Technology Control Options

Most of the preprocess pollution prevention activities reported in the detailed questionnaire involve good operating practices that any industrial laundry can technically implement. The two most commonly reported activities, refusal of items containing free liquids and refusal of certain items, require that laundries work with their customers to reduce pollutant loads. This presents a challenge to laundries to maintain their customer base while still controlling the amount of contaminants they take in. Another commonly reported preprocess activity viewed as a good operating practice is the reduction of free liquids in laundry items by centrifugation before the items are water-washed. After centrifugation, the liquid removed from the items is reused by the customer or disposed of as hazardous waste. Either the customer or the industrial laundry technically could perform this preprocess activity.

All of the in-process pollution prevention activities reported by industrial laundries reduce pollution at the facilities that implement them and reduce operating costs by optimizing laundry operations. The installation of alternative washers and automated liquid injection systems for washers, the use of alternative washing chemicals and water softening, and the implementation of water reuse/reduction all can reduce the amount of water and/or chemicals that a laundry uses. A significant number of industrial laundries have improved employee training and housekeeping standards, which can also decrease water and chemical use. In addition, changes in laundering chemicals were reported to improve treatability of the wastewater by forming emulsions that are more easily broken.

Most of the industrial laundries from which EPA has gathered data used for the development of DAF and chemical precipitation pretreatment standards practice refusal of items containing free liquids to some degree. Therefore, EPA has included this preprocess pollution prevention practice as a component of the technology options involving DAF or chemical precipitation treatment of process wastewater. EPA evaluated the use of steam stripping as a stand-alone technology for the OC-only technology control option, discussed in Section 8.2.2 of this document. Use of the other preprocess and in-process pollution prevention practices, described in Chapter 6 of this document, as stand-alone technology control options were considered, but reasonably rejected. These options were rejected because the practices varied too greatly among individual facilities to construct an acceptable regulatory framework and because the available data were insufficient to identify specific pollutant loading reductions and costs associated with the use of these practices. In addition, EPA did not have sufficient facility-specific information to evaluate how many facilities could afford to implement these preprocess or in-process practices.

8.4 Exclusion of Wastewater Recycling Activities from the Technology Control Options

Some industrial laundries reported that they have incorporated wastewater recycling activities into their processes, as described in Section 6.4 of this document. EPA has found that the use of wastewater recycling largely depends upon customer demands on product quality, the facility's product mix, and the level of wastewater treatment at the facility. In addition, EPA has limited data that show wastewater recycling activities in the industrial laundries industry do not necessarily result in a facility using less process water than a facility that does not recycle, due to facility-specific factors (2). EPA concluded that it does not have sufficient data to completely analyze the effects of wastewater recycling on costs or pollutant loadings. Therefore, EPA did not incorporate wastewater recycling activities into the technology options.

8.5 Subcategorization Analysis

EPA typically assesses several factors to determine whether segmenting or subcategorizing an industrial category and considering different technology control options for those segments or subcategories would be appropriate. These factors were assessed for the Industrial Laundries Point Source Category and are listed below:

- Disproportionate economic impacts;
- Laundry processes and water use practices;
- Plant age;
- Plant location;
- Plant size;
- Raw materials;
- Non-water quality environmental impacts (energy usage, air emissions, and solid waste generation); and
- Type of item laundered and wastewater characteristics.

Based on the results of this examination, EPA determined that the Industrial Laundries Point Source Category warrants no formal subcategorization other than regulatory exclusions for certain smaller production facilities. Because costs of options may be dependent on all of the above factors, consideration of these factors is incorporated into the costing analysis for the final action. EPA did find that disproportionate economic impacts on small facilities warrant exclusion of some of those facilities from the technology control options. Also, as discussed in Chapter 4 of this document, EPA used laundry processes and water use practices and type of

item laundered as the basis for defining the scope of the industry. The remainder of this section discusses EPA's analysis of each of the factors listed above.

8.5.1 Disproportionate Economic Impacts

EPA looked at production as a means of defining applicability of pretreatment standards for this industry; EPA used production as a good indicator of size for industrial laundries because it is easily measured and closely tracked by the industry. In examining production levels, EPA determined that larger industrial laundries have an advantage over small facilities: they enjoy economy of scale in treating their wastewater and generally have more economic resources than small facilities. Because of these differences in economy of scale and economic resources, a disproportionate amount of negative economic impacts would occur at small facilities from implementation of national pretreatment standards. EPA evaluated three exclusions based on production level for small facilities in conjunction with the final technology control options and candidate pretreatment standards. The Economic Assessment document (3) and the Cost-Effectiveness Analysis (4) present EPA's rationale for these exclusions. The exclusions evaluated are:

- 1 Million/255 K - Facilities processing less than 1,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually would be excluded.

- 3 Million/120 K - Facilities processing less than 1,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually and facilities processing less than 3,000,000 pounds of incoming laundry and less than 120,000 pounds of industrial towels annually would be excluded.

- 5 Million/255 K - Facilities processing less than 5,000,000 pounds of incoming laundry and less than 255,000 pounds of industrial towels annually would be excluded.

8.5.2 Laundry Processes and Water Use Practices

EPA looked at laundering processes and water use practices in terms of a possible basis for subcategorization. As discussed in Section 4.8 of this document, EPA examined laundry operations and wastewater characteristics in defining the scope of the industry. EPA examined operations that generate wastewater and those that do not, and excluded those operations that do not generate wastewater. EPA then evaluated the wastewater characteristics for all water-washing operations, which includes dry cleaning followed by water washing. Based on the evaluation, EPA determined that wastewater characteristics are similar for all laundry water-washing operations, and therefore do not provide an adequate basis for subcategorization. Wastewater characteristics are primarily a function of the types of items laundered, and not the facility's laundering processes.

8.5.3 Plant Age

The age of an industrial laundry is an indefinite parameter primarily because of the upgrading and modernization that most facilities do to remain competitive, as discussed in Chapter 4 of this document. EPA therefore did not consider plant age as a basis for subcategorization.

8.5.4 Plant Location

Industrial laundries are located throughout the United States and are not generally limited to any one geographical location, as discussed in Chapter 4 of this document. EPA did not subcategorize based on geographical location because location would not affect the ability of industrial laundries to comply with national pretreatment standards.

8.5.5 Plant Size

In analyzing plant size as a basis for subcategorization and also as part of the analysis to minimize any disproportionate economic impacts, EPA examined the following factors to determine if any of them would be appropriate as a basis of subcategorization: number of employees, wastewater discharge flow rate, and production. The analysis of each of these factors is discussed below.

8.5.5.1 Number of Employees

Raw materials, laundering processes, and wastewater characteristics are independent of the number of employees at a facility. It is difficult to correlate the number of employees to wastewater generation due to variations in laundry staffing. Fluctuations can occur for many reasons, including shift differences, clerical and administrative support staff, maintenance workers, efficiency of site operations, and market fluctuations. For these reasons, EPA did not subcategorize by number of employees.

8.5.5.2 Wastewater Discharge Flow Rate

EPA did not subcategorize by wastewater discharge flow rate because the wastewater characteristics for a facility are independent of the overall wastewater discharge flow rate from a facility. Wastewater characteristics are primarily a function of the types of items laundered at a facility, and not the facility's overall wastewater discharge flow rate. For example, a facility laundering 100 pounds of laundry and discharging 300 gallons per year of wastewater would have wastewater characteristics similar to a facility processing 100,000 pounds of laundry and discharging 300,000 gallons of wastewater per year, provided the facilities are laundering similar items.

EPA also considered wastewater flow rate per pound of laundry processed as a potential basis for subcategorization of the industry. As shown in Figure 5-1 in Chapter 5 of this document, most facilities in the industry have production-normalized water use of between 1.5

and 3.5 gallons per pound of laundry processed. Because of the narrow range of production-normalized water use amounts, EPA did not subcategorize by this parameter.

8.5.5.3 Production

As with wastewater discharge flow rate, wastewater characteristics for a facility are independent of the overall production volume at a facility. Wastewater characteristics are primarily a function of the types of items laundered at a facility, and not the facility's overall production, as shown in the example discussed in the previous paragraph of this section.

However, as discussed in Section 8.5.1 of this document, EPA looked at production in determining the applicability of the candidate pretreatment standards to the industry. EPA evaluated several exclusions with regard to production; these exclusions were discussed in Section 8.5.1 of this document.

8.5.6 Raw Materials

The raw materials used in the industrial laundries industry primarily consist of chemicals used in the laundering process. Chemicals that are frequently used in the industry include alkaline solutions, detergent, bleach, antichlor, sour, softener, and starch; other chemicals used include enzymes, builders, oil treatment chemicals, water conditioners, dyes, stain treatment chemicals, and bactericides. The chemicals most commonly used across the industry and on a variety of laundry items are detergent, bleach, and sour. Chemical usage varies from wash cycle to wash cycle depending on product mix and equipment used for laundering. Waste load and wastewater treatability are not directly correlated to chemicals used in laundering. Because of the wide variety of chemicals and wash formulas used in the industry and the complexities involved in laundering chemistry, EPA determined it was not appropriate to subcategorize based on chemicals used in the laundering process.

8.5.7 Non-Water Quality Environmental Impacts

Non-water quality environmental impacts for the industrial laundries industry include wastewater treatment residual and sludge disposal, air emissions, and energy requirements. As discussed in Chapter 10 of this document, EPA estimates that minimal non-water quality impacts would result from implementation of the final technology control options considered. Therefore, EPA determined that these non-water quality environmental impacts are not an adequate basis for subcategorizing the industrial laundries industry.

8.5.8 Type of Item Laundered and Wastewater Characteristics

As discussed in Section 4.8 of this document, the types of items laundered by facilities in the scope of this industry as defined by EPA include, but are not limited to, the following industrial textile items: shop towels, printer towels/rags, furniture towels, rags, uniforms, mops, mats, rugs, tool covers, fender covers, dust-control items, gloves, buffing pads, and absorbents. Laundering of nonindustrial textile items is also covered when industrial textile items are laundered at the same facility.

EPA examined type of item as a possible basis of subcategorization, as wastewater characteristics differ depending on items laundered. As presented in Chapter 5 of this document, printer towels/rags, shop towels, and mops generally have concentrations of pollutants that are greater than the concentrations for floor mats and industrial garments. EPA determined that laundering of printer towels/rags and shop towels generates 34 percent of the toxic-weighted wastewater pollutant load from the total industry production and 60 percent from total industrial laundry production, although these items represent only 5 percent of the total industry production and 10 percent of the total industrial laundry production (see Section 17.8 of the Industrial Laundries Administrative Record).

EPA considered requiring different wastewater standards for wastewater generated from laundering printer towels/rags, shop towels, and mops than for wastewater generated from laundering other items. However, laundries typically clean a variety of items and typically combine wastewater from all items laundered. Thus, subcategorizing the industry by type of item laundered with different standards for different types of items would require segregation and separate treatment of waste streams. Most industrial laundries with wastewater treatment currently operate only one treatment system, and monitor their effluent at only one discharge point. Because of the cost and recordkeeping burden that would be involved if the industry was subcategorized by item type, EPA decided that item type is not a reasonable basis for subcategorizing the industry.

However, EPA did consider item type as a basis for reduced applicability of pretreatment standards. As discussed in this chapter, EPA considered technology control options that would cover only facilities processing industrial textile items, heavy items, or industrial towels as part of the overall analysis of technology control options. EPA considered these options in order to evaluate the costs and economic impacts of controlling only the most concentrated sources of wastewater pollutants.

8.6 Initial Technology Control Options Not Further Considered

EPA eliminated the Heavy options from further consideration because EPA determined that, in these options, the untreated light wastewater stream at some facilities has higher concentrations of pollutants than the treated heavy wastewater stream. In addition, for these technology options, standards would be applicable to only a portion of a facility's wastewater flow. This presents a significant difficulty for the permitting authorities and regulated facilities in that these options would require an in-plant monitoring point. This also would be coupled with a need for detailed record keeping by the facility and information collection by the permitter regarding production and flow rates associated with specific laundry items to assure compliance with standards developed for the Heavy options. EPA ultimately concluded that in-plant standards and this level of detailed data collection present an unacceptable compliance burden and cost to the industrial laundries industry that is not warranted, and would be more difficult to enforce by POTWs than the options covering all of the facility's wastewater.

8.7 Additional Technology Control Options Considered

EPA considered additional alternative technology control options, which were variations on the initial DAF and chemical precipitation technology options presented above, to find the most effective option for the industry. These additional options involve treating different portions of the total facility process wastewater, then combining the treated and untreated wastewater prior to monitoring and final discharge. These additional options are described in the sections below.

Table 8-2 summarizes the 12 additional technology control options considered for PSES and PSNS.

8.7.1 Industrial Laundry Wastewater (IL) Technology Control Options

The IL wastewater technology control options, DAF-IL and CP-IL, are similar to the DAF-Heavy and CP-Heavy technology control options shown in Figures 8-2 and 8-3, respectively, in that they treat a portion of the facility's wastewater stream. However, in the IL options, wastewater from both heavy and light industrial textile items is treated. The treated stream is combined with the untreated nonindustrial wastewater stream prior to monitoring and discharge. Thus, in Figures 8-2 and 8-3, the heavy and light industrial wastewater streams are represented by the "heavy" stream in the diagram and the nonindustrial wastewater stream is represented by the "light" stream in the diagram. The standards applied to the combined streams would be based on treatment performance data for the DAF-All technology option (in the DAF-IL option) and the CP-All technology option (in the CP-IL option).

EPA has determined that the wastewater generated from laundering of nonindustrial textile items has pollutant concentrations generally lower than the standards developed from both DAF and chemical precipitation treatment of the total facility process wastewater stream. Therefore, pollutant concentrations in the combined streams prior to final discharge for the IL options would be lower than the standards based on treatment of the total process wastewater stream (DAF-All and CP-All). EPA concluded that nonindustrial wastewater does not need treatment to meet those standards. EPA developed the IL wastewater technology control options to treat the majority of pollutants in a facility's process wastewater (the pollutants generated from industrial laundry) with a lower-cost treatment system than the All options.

8.7.2 Towel (TWL) Technology Control Options

The TWL wastewater technology control options are nearly identical to the DAF-Heavy and CP-Heavy technology options shown in Figures 8-2 and 8-3, respectively, including treatment of wastewater generated from washing heavy industrial laundry items, as defined in Section 8.2.1 of this document. Light industrial and nonindustrial wastewater is discharged without treatment. Thus, in Figures 8-2 and 8-3, the heavy industrial wastewater stream is represented by the "heavy" stream in the diagram and the light industrial and nonindustrial wastewater streams are represented by the "light" stream in the diagram. However, the TWL options incorporate standards that are applied to the combined untreated and treated streams prior

to discharge and that are based on treatment performance data for the DAF-All and CP-All technology control options.

8.7.3 Combination (Combo) Technology Control Options

EPA also considered technology control options in which standards would be based on a combination of the DAF-IL and CP-IL standards. The combination options were developed to provide industry with increased flexibility in the treatment technologies used, resulting in more cost-effective technology options. These combination options, Combo-IL and Combo-IL-2LIM, are described below.

Table 8-2

Definitions of Additional Technology Control Options Considered for PSES and PSNS

Technology Control Option	Description	Basis of Standards[1]
DAF-IL	Dissolved air flotation of wastewater from industrial laundry items.	DAF-All
CP-IL	Chemical precipitation of wastewater from industrial laundry items.	CP-All
Combo-IL	Dissolved air flotation or chemical precipitation of wastewater from industrial laundry items. Facilities without treatment are costed for the less expensive technology on an annualized basis.	The higher LTA between DAF-All and CP-All
Combo-IL-2LIM	Dissolved air flotation or chemical precipitation of wastewater from industrial laundry items. Facilities without treatment are costed for chemical precipitation.	DAF-All or CP-All, based on technology costed
DAF-TWL	Dissolved air flotation of wastewater from heavy industrial laundry items.	DAF-All
CP-TWL	Chemical precipitation of wastewater from heavy industrial laundry items.	CP-All
Combo-TWL	Dissolved air flotation or chemical precipitation of wastewater from heavy industrial laundry items. Facilities without treatment are costed for the less expensive technology on an annualized basis.	The higher LTA between DAF-All and CP-All
Combo-TWL-2LIM	Dissolved air flotation or chemical precipitation of wastewater from heavy industrial laundry items. Facilities without treatment are costed for chemical precipitation.	DAF-All or CP-All, based on technology costed
Combo-All	Dissolved air flotation or chemical precipitation of all facility process wastewater. Facilities without treatment are costed for the less expensive technology on an annualized basis.	The higher LTA between DAF-All and CP-All
Combo-All-2LIM	Dissolved air flotation or chemical precipitation of all facility process wastewater. Facilities without treatment are costed for chemical precipitation.	DAF-All or CP-All, based on technology costed
Towel Only	Dissolved air flotation of wastewater from industrial towels.	DAF-Heavy
No Regulation	No national categorical pretreatment standards.	---

[1]Pollutant concentration data representing each treatment option are presented in Chapter 7 of this document.

The Combo-IL technology control option combines both the DAF-IL and CP-IL standards into one set of standards for the industrial laundries industry. These standards would be established based on the less stringent of the standards for the two technology control options for each pollutant. EPA's data show that, overall, chemical precipitation performs slightly better than DAF in treating industrial laundry process wastewater. However, many industrial laundries have already installed DAF systems. Having one set of standards allows flexibility for facilities with either technology currently in place to meet those standards. In developing cost estimates for this option, industrial laundries that already have DAF or chemical precipitation treatment systems with enough capacity to treat the heavy wastewater stream (as defined above in the IL Technology Options section) were assumed to continue to treat their wastewater using their existing technology. Industrial laundries with little or no treatment (including facilities that treat their wastewater with chemical emulsion breaking) were costed for the least expensive technology control option (based on a comparison of DAF-IL and CP-IL annualized costs) to treat their industrial laundry wastewater.

The Combo-IL-2LIM technology control option is similar to the Combo-IL option. In this option, the standards for the DAF-IL option would apply to facilities using DAF to treat their wastewater and the standards for the CP-IL option would apply to all other facilities. This option also allows flexibility for facilities with DAF treatment in place (DAF is the most common treatment in the industry) to comply with DAF-based standards, but requires all other facilities to comply with slightly more stringent standards based on chemical precipitation. In developing cost estimates for this option, industrial laundries that already have DAF or chemical precipitation treatment systems with enough capacity to treat the heavy wastewater steam (as defined above in the IL Technology Control Options section) were assumed to continue to treat their wastewater using their existing technology. Industrial laundries with little or no treatment (including facilities that treat their wastewater with chemical emulsion breaking) were costed for the CP-IL technology control option to treat their industrial laundry wastewater.

EPA also considered Combo options in which all process wastewater would be treated (Combo-All and Combo-All-2LIM). These options were modeled in a manner similar to the Combo-IL and Combo-IL-2LIM options described above, but resulted in higher compliance costs.

As in the IL options, EPA also considered additional TWL technology options (Combo-TWL and Combo-TWL-2LIM). In these options, standards are based on a combination of the DAF-TWL and CP-TWL standards to allow for increased flexibility in the technologies used by industry to treat their heavy industrial laundry wastewater, allowing for a more cost-effective technology option.

8.7.4 Towel Only Technology Control Option

Some commenters on the proposed rule indicated that EPA should consider regulating only facilities that launder shop and printer towels/rags, because these items have the highest pollutant loadings of all items laundered by industrial laundries. As a result of the comments, EPA evaluated a modified heavy option that would require only facilities that launder shop towels, printer towels, furniture towels, or other industrial towels/rags to meet the proposed

standards. EPA referred to this option as the Towel Only option. The Towel Only option is based on treating only the wastewater from laundering industrial towels, then mixing the treated wastewater with wastewater from laundering all other items prior to monitoring and discharge from the facility. The modified option is based on DAF technology because EPA does not have treatment performance data characterizing chemical precipitation treatment of only shop and printer towels/rags. EPA presented the Towel Only option in the Notice of Data Availability (NODA) published December 23, 1998 (63 FR 71054).

8.7.5 No Regulation Option

EPA also considered a no regulation option, which entails having no national categorical pretreatment standards. Facilities would only need to comply with applicable local standards. EPA assumed there would be no compliance costs or pollutant removals associated with this option.

8.8 Technology Control Options Eliminated from Further Consideration

Based on technical and economic analyses, EPA eliminated the following technology control options from further consideration for the proposed rule:

- DAF-TWL;
- CP-TWL;
- Combo-TWL;
- Combo-TWL-2LIM;
- DAF-All;
- CP-All;
- Combo-All; and
- Combo-All-2LIM.

The reasons for eliminating these options from further consideration are presented below.

EPA eliminated the TWL options from further consideration because some of the pollutant concentrations in the untreated light industrial and nonindustrial wastewater streams can be found at higher concentrations than the standards for these technology options.

EPA eliminated the All options, shown above, from further consideration because, although these options can achieve the same effluent pollutant concentrations as the DAF-IL and CP-IL options, the costs to treat the total facility process wastewater in these All options are higher than the costs for the IL options.

The following five technology control options were considered for the industrial laundries proposed rule:

- DAF-IL;
- CP-IL;
- Combo-IL;

- Combo-IL-2LIM; and
- OC-Only.

These options became regulatory options considered as the basis for the proposed PSES. EPA performed detailed analyses of costs, pollutant removals, and economic impacts for these options as described in Chapter 12 of the proposed Technical Development Document (5) and the proposed Economic Assessment (EA) (6).

After proposal, EPA eliminated the OC-Only option from further consideration because of the small amount of nonvolatile pollutant removals achieved by the option relative to the cost, and because of the limited data available to support the option. EPA eliminated the Combo-IL and Combo-IL-2LIM options from further consideration because they did not remove as many pollutants as the CP-IL option and had overall higher costs than the CP-IL option. The DAF-IL option was retained because of the predominance of DAF treatment in the industry and the pollutant removals achieved by DAF, even though the DAF costs were high relative to the other options.

Based on comments on the NODA, EPA decided that the Towel Only option was complicated to implement and enforce and could result in significantly increased monitoring costs. Facilities might be required to monitor one portion of their effluent for compliance with the categorical standards and to monitor the remainder of their effluent for compliance with local limits. In addition, there was limited treatment performance data available from facilities treating Towel Only wastewater. Therefore, EPA eliminated the Towel Only option from further consideration.

8.9 Regulatory Control Options Considered for the Final Action

The regulatory control options considered by EPA for the final action were:

CP-IL - Chemical precipitation of wastewater from industrial laundry items;

DAF-IL - Dissolved air flotation of wastewater from industrial laundry items; and

No Regulation - No national categorical pretreatment standards for the industry.

For the CP-IL and DAF-IL options, EPA also considered three exclusions, as discussed in Section 8.5.1 of this document. Chapters 9 and 11 of this document, respectively, discuss pollutant removals and costs for the regulatory options.

8.10 References

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2. Memorandum: Preliminary Data for Calculating Mass-Based Limitations for the Industrial Laundries Industry, August 15, 1997.

3. U.S. Environmental Protection Agency. Economic Assessment for the Final Action Regarding Pretreatment Standards for the Industrial Laundries Point Source Category (Revised February 2000). EPA-821-R-00-004, Washington, DC, February 2000.

4. U.S. Environmental Protection Agency. Cost-Effectiveness Analysis for the Final Action Regarding Pretreatment Standards for the Industrial Laundries Point Source Category (Revised February 2000). EPA-821-R-00-005, Washington, DC, February 2000.

5. U.S. Environmental Protection Agency. Technical Development Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category. EPA-821-R-97-007, Washington, DC, November 1997.

6. U.S. Environmental Protection Agency. Economic Assessment for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category. EPA-821-R-97-005, Washington, DC, November 1997.

CHAPTER 9

POLLUTANT LOADING AND REMOVAL ESTIMATES

9.1 Introduction

This chapter presents annual pollutant loading and removal estimates for the industrial laundries industry for each of the regulatory options considered for the final action. A number of additional technology control options considered for development of a rule is described in Chapter 8 of this document. Information on these options was contained in the Technical Development Document for the proposed rule (1) and in the record for the Notice of Data Availability (NODA) (63 FR 71054; December 23, 1998). The estimated pollutant loadings and removals for these options can be found in the Industrial Laundries Administrative Record.

EPA estimated the pollutant loadings and removals from industrial laundries to evaluate the effectiveness of the treatment technologies, to estimate benefits gained from the removal of pollutants discharged through publicly owned treatment works (POTWs) to surface water, and to evaluate the cost effectiveness of the regulatory options in reducing the pollutant loadings. The regulatory options considered for the final action include dissolved air flotation of industrial laundry wastewater (DAF-IL) and chemical precipitation of industrial laundry wastewater (CP-IL). In addition, EPA evaluated three exclusion scenarios for both of these regulatory options, as described in Chapter 8 of this document.

Untreated, baseline, and postcompliance pollutant loadings and pollutant removals for the industry were estimated for 72 pollutants of concern using data obtained from the industry. Data on wastewater treatment in place and production and wastewater flows were reported for the 1993 operating year in the 1994 Industrial Laundries Industry Questionnaire (detailed questionnaire). Untreated, baseline, and postcompliance pollutant loadings are defined as follows:

- Untreated loadings -- pollutant loadings in industrial laundry raw wastewater. These loadings do not account for wastewater treatment reported in the detailed questionnaire.

- Baseline loadings -- pollutant loadings in industrial laundry wastewater being discharged to POTWs in 1993. These loadings do account for wastewater treatment reported in the detailed questionnaire.

- Postcompliance loadings -- pollutant loadings in industrial laundry wastewater after implementation of a rule. These loadings were calculated assuming that all industrial laundries would operate the wastewater treatment technologies and meet the long-term averages (LTAs) for the pollutants contained in each of the regulatory options.

The following information is presented in this chapter:

- Section 9.2 presents the data sources that were used to estimate pollutant loadings and removals;
- Section 9.3 discusses the methodology used to estimate pollutant loadings and pollutant removals;
- Section 9.4 presents the pollutant loadings and removals for each regulatory option, including untreated, baseline, and postcompliance pollutant loadings and removals of pollutants from baseline levels to postcompliance levels;
- Section 9.5 presents the pollutant baseline and postcompliance loadings and pollutant removals for each regulatory option estimated from updated wastewater treatment information provided in a 1998 survey conducted by the industrial laundries trade associations; and
- Section 9.6 presents the references used.

9.2 Data Sources

EPA used data from several sources to estimate untreated, baseline, and postcompliance loadings for industrial laundry wastewater. These sources included EPA site visits and sampling episodes at industrial laundries, detailed monitoring questionnaires (DMQ), the Preliminary Data Summary (PDS), and data received in comments on the proposed rule. Chapter 3 of this document discusses these data sources in detail.

To estimate *untreated pollutant loadings* for the industrial laundries industry, EPA estimated pollutant concentrations and loadings for 72 pollutants at 190 in-scope industrial laundries that submitted sufficient information in response to the detailed questionnaire (in-scope facilities meet the definition of an industrial laundry as presented in Chapter 4 of this document). In addition, EPA estimated the untreated loadings for three exclusion scenarios for each regulatory option (discussed in Chapter 8 of this document). EPA then extrapolated the loadings to the entire industry based on the survey weights developed for each facility. The untreated pollutant concentrations and loadings for each facility were estimated using analytical data obtained by EPA for specific laundering processes and item types, and the process/item-specific production reported in the detailed questionnaire.

EPA collected data for specific process/item combinations for individual loads laundered at a facility or for an entire stream generated from the same process/item combination. EPA used the following process/item data to estimate untreated pollutant loadings:

- Water washing of industrial garments -- data from three loads of pants and three loads of shirts collected during three sampling episodes;

- Water washing of shop towels -- data from four loads of shop towels collected during four sampling episodes and two days of data collected for EPA's PDS from a shop-towel-only stream at a facility sampled between 1985 and 1987;

- Water washing of printer towels/rags -- data from three loads of printer towels/rags collected during three sampling episodes;

- Water washing of mats -- data from three loads of mats collected during two sampling episodes;

- Water washing of mops -- data from two loads of mops (with either no oil treatment or oil added outside of the washer) collected during two sampling episodes;

- Steam tumbling followed by water washing of printer towels/rags -- data from one load collected during a sampling episode;

- Water washing of linen items -- three days of data for a linen-only stream collected during a sampling episode and DMQ data for three facilities that launder greater than 93 percent linen; and

- Dry cleaning followed by water washing of shop towels, printer towels/rags, and gloves -- facility-collected data obtained during a site visit from a wastewater stream generated from dry cleaning followed by water washing.

EPA estimated *baseline loadings* for individual facilities from untreated or treated loadings, based on the wastewater treatment in place reported by the facility in the detailed questionnaire. The data that were used to calculate untreated loadings are described above. EPA estimated treated loadings from the data presented in Sections 7.2.1, 7.2.2, and 7.2.3 of this document for the five treatment options for which EPA had data. These treatment options were used to develop the technology control options discussed in Chapter 8 of this document.

Postcompliance loadings were estimated for the regulatory options and exclusions thereof. These regulatory options were developed using the data obtained for two of the treatment options, as discussed in Chapters 7 and 8 of this document.

Section 9.3 of this document presents details on the methodology used to estimate the pollutant loadings and removals.

9.3 Methodology Used to Estimate Pollutant Loadings and Removals

This section presents the methodology used to estimate untreated, baseline, and postcompliance pollutant loadings and removals of pollutants from baseline levels to postcompliance levels.

9.3.1 Methodology Used to Estimate Industry Untreated Pollutant Loadings

EPA estimated untreated pollutant loadings for each of the 190 in-scope facilities using the process/item-specific data discussed in Section 9.2 of this document, and extrapolated these loadings to represent the entire industry using the appropriate survey weights. Untreated pollutant loadings do not account for pollutant removals by wastewater treatment technologies in place at industrial laundries in 1993, as reported in the detailed questionnaire.

The amount of pollutant generated per pound of laundry was estimated from the process/item-specific data. EPA estimated the pollutant loadings per pound of item laundered for each process/item combination using the following equation:

$$\text{Concentration (mg/L, for process/item data)} \times \frac{\text{Flow (L, for process/item)}}{\text{Production (lbs, for process/item)}} = \text{Amount of pollutant generated per pound of laundry (mg/lb)}$$

EPA calculated the pollutant loading per pound of item for each item-specific stream for which data were available. If data from more than one load or more than one facility represented a process/item combination, an average of the individual load or facility's pollutant loadings was calculated. If a specific pollutant was never detected or never analyzed for on a particular item, the pollutant loading for that process/item/pollutant combination was set to zero milligrams of pollutant per pound of laundry. Table 9-1 presents the pollutant loading generated per pound of item for several pollutants and groups of pollutants (e.g., toxic organic pollutants) for the process/item combinations presented in Section 9.2 of this document.

Pollutant concentration data were not obtained for all of the process/item combinations reported by the 190 in-scope facilities in the detailed questionnaires. To estimate the pollutant loadings for all facilities, EPA transferred pollutant concentration data from the process/item combinations with data available to other process/item-specific combinations for which data were not available. Table 9-2 presents these data transfers. The process/item-specific pollutant concentrations were transferred to items having similar customers and/or uses, similar degrees of pollutant loadings, and being laundered with similar types of chemicals.

For each of the 190 in-scope facilities, EPA then calculated the untreated wastewater pollutant concentrations and loadings from the amount of pollutant generated per pound of laundry for each process/item combination and process/item-specific production and flow data. The production and flow data were obtained from the information reported by each facility in the detailed questionnaire. The following equation was used to calculate the pollutant concentrations for each facility:

$$\text{Amount of pollutant generated per pound of laundry (mg/lb)} \times \frac{\text{Production (lbs of process/item at facility)}}{\text{Flow (L, for process/item at facility)}} = \text{Facility untreated concentration (mg/L, for process/item)}$$

Table 9-1

Pollutant Loadings per Pound of Item Processed (mg Pollutant/lb Laundry)

Pollutant	Industrial Garments	Shop Towels	Printer Towels/Rags	Steam Tumbled Printer Towels/Rags	Mats	Mops	Linen Items	Items Dry Cleaned Prior to Water Washing
BOD_5	2,578	20,293	51,581	12,998	544	13,646	7,237	1,605
O&G (measured as HEM)	932	23,160	94,464	15,535	314	3,378	1,295	NA
TPH (measured as SGT-HEM)[1]	326	12,845	30,828	4,226	145	1,316	147	NA
TSS	2,160	36,709	14,735	11,915	2,050	13,152	2,241	1,165
COD	12,281	111,985	222,981	81,240	1,515	64,242	9,376	9,011
TOC	2,627	16,110	33,168	15,977	340	6,192	4,817	NA
TXM	21	235	326	75	14	73	15	26
TXO	11	350	1,045	89	12	53	25	14
NCM	114	602	298	93	107	348	83	107
NCO	35	1,341	2,707	1,041	11	247	54	14

[1]SGT-HEM is measured by Method 1664 (promulgated at 64 FR 26315; May 14, 1999). In this method, EPA defines SGT-HEM as non-polar material (NPM). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to SGT-HEM as TPH.

BOD_5 - Biochemical oxygen demand.
O&G - Oil and grease.
HEM - Hexane extractable material.
NA - Not available.
TPH - Total petroleum hydrocarbon.
SGT-HEM - Silica gel treated-hexane extractable material.
TSS - Total suspended solids.
COD - Chemical oxygen demand.
TOC - Total organic carbon.
TXM - Total priority metals and elements.
TXO - Total priority organics.
NCM - Nonconventional metals.
NCO - Nonconventional organics.

Table 9-2

Analytical Data Transfers

Analytical Data Transfers for Water-Washed Items[1]		
Item	**Item-Specific Data to be Transferred**	**Basis of Data Transfer**
Health-Care Items (B08)	Linen (B06, B07)	Customer and Use
Family Laundry (B15)	Linen (B06, B07)	Customer and Use
Executive Wear (B18)	Linen (B06, B07)	Customer and Use
Continuous Roll Towels (B10)	Linen (B06, B07)	Customer
Miscellaneous Not Our Goods (NOG) (B19)	Linen (B06, B07)	Customer
New Items (B17)	Linen (B06, B07)	Pollutant Loading
Clean Room Garments (B11)	Linen (B06, B07)	Pollutant Loading
Laundry Bags (B14)	Industrial Garments (B01)	Customer and Chemical Use
Fender Covers (B09)	Shop Towels (B02)	Customer and Use
Filters (B23)	Shop Towels (B02)	Customer and Use
Other (unspecified) (B13)	Floor Mats (B04)	Chemical Use
Buffing Pads (B24)	Floor Mats (B04)	Customer and Use
Analytical Data Transfers for Processes		
Process	**Process Data to be Transferred**	**Basis of Data Transfer**
Denim Prewash	Water Washing of Linen Items	Pollutant Loading
Dual-Phase Processing	Dry Cleaning Followed by Water Washing[2]	Chemical Use and Pollutant Loading

[1]Codes in parenthesis refer to codes used in the detailed questionnaire.
[2]If data were not available for a specific pollutant, data were transferred from water washing of mats.

From the facility-specific concentration, the annual pollutant loading for each facility process/item was calculated using the following equation:

$$\text{Facility untreated concentration (mg/L, for process/item)} \times \text{Facility annual flow (L/yr, for process/item)} \times \frac{1\text{ lb}}{453{,}600\text{ mg}} = \text{Facility untreated annual loading (lbs/yr, for process/item)}$$

To estimate the total untreated wastewater pollutant loading for a facility, EPA summed the loadings calculated from each process/item combination for each pollutant.

9.3.2 Methodology Used to Estimate Industry Baseline Wastewater Loadings

Industry baseline loadings represent the industry pollutant loadings after accounting for removal of pollutants from untreated wastewater by treatment technologies in place at industrial laundries. Chapter 11 of this document discusses the assessment of treatment in place for industrial laundries. Based on information provided in the detailed questionnaire for the 1993 operating year, the treatment technologies in use at industrial laundries included chemical emulsion breaking, dissolved air flotation, chemical precipitation, microfiltration, and ultrafiltration. Some facilities use these technologies to treat their entire process wastewater stream, while other facilities treat only part of their process wastewater.

Table 9-3 presents the various treatment-in-place scenarios for the 190 in-scope facilities. EPA calculated baseline pollutant loadings based on the reported capacity of each facility's treatment system (i.e., the amount of treated wastewater discharged) and the appropriate set of target average concentrations chosen for each facility. The set of target average concentrations was chosen based on an approximation of the type of treated wastewater that is generated from the facility's treatment system.

The baseline pollutant loadings for facilities with no treatment in place are equivalent to the facilities' untreated pollutant loadings, as discussed in Section 9.3.1 of this document. The baseline pollutant loadings for facilities that have treatment in place were estimated by applying the appropriate set of target average concentrations to the annual facility treated wastewater discharge flow as shown in the following equation:

$$\text{Target average concentration for treatment in place (mg/L)} \times \text{Facility annual treated discharge flow (L/yr)} \times \frac{1\text{ lb}}{453{,}600\text{ mg}} = \text{Facility baseline annual loading for treated wastewater (lbs/yr)}$$

The baseline pollutant loadings for a facility treating a portion of their wastewater are the sum of the facility baseline annual loading for the treated portion of the wastewater (as calculated above) and the annual pollutant loading for the untreated portion of wastewater (calculated as described in Section 9.3.1 of this document).

Table 9-3

Treatment-In-Place Scenarios for Model Facilities

Treatment In Place	Definition	Source of Target Average Concentrations for Treated Baseline Loadings	Number of In-Scope Facilities with Treatment In Place
None	No treatment present at the facility	NA	127[1]
CEB-Heavy	Chemical emulsion breaking of sufficient capacity to treat wastewater generated from laundering heavy industrial textile items	CEB-Heavy	5[2]
<DAF-IL	Dissolved air flotation of insufficient capacity to treat wastewater generated from laundering industrial textile items	DAF-IL	1
DAF-IL	Dissolved air flotation of sufficient capacity to treat wastewater generated from laundering industrial textile items	DAF-IL	1
DAF-All	Dissolved air flotation of sufficient capacity to treat all facility process wastewater	DAF-All	33
<CP-Heavy	Chemical precipitation of insufficient capacity to treat wastewater generated from laundering heavy industrial textile items	CP-Heavy	4
<CP-IL	Chemical precipitation of insufficient capacity to treat wastewater generated from laundering industrial textile items	CP-IL	1[3]
CP-IL	Chemical precipitation of sufficient capacity to treat wastewater generated from laundering industrial textile items	CP-IL	1
CP-All	Chemical precipitation of sufficient capacity to treat all facility process wastewater	CP-All	17[4]

[1]Three of these facilities process the majority of their industrial laundry items with a dry-cleaning followed by water-washing process. EPA assumed these facilities would meet the limitations for the DAF-IL and CP-IL regulatory options without installing these treatment technologies.
[2]Three facilities reported CEB treatment of the total wastewater stream. EPA does not have data representing CEB treatment of the total wastewater stream; the baseline pollutant loadings for these facilities were estimated assuming they are only treating heavy industrial laundry wastewater.
[3]This facility operates a microfiltration unit. Since microfiltration can achieve lower final effluent pollutant concentrations than chemical precipitation when operated properly (2), this facility is considered to have better treatment in place than the CP-Heavy option.
[4]One of these facilities operates an ultrafiltration unit. Since ultrafiltration can achieve lower final effluent pollutant concentrations than chemical precipitation when operated properly (2), this facility is considered to have better treatment in place than the CP-All option.

NA - Not applicable.

EPA calculated target average concentrations used in estimating the baseline pollutant loadings from the analytical data described in Section 7.2 of this document. Prior to calculating the target average concentrations, the data were edited using procedures described in Chapter 7 of this document for calculating long-term averages, variability factors, and candidate pretreatment standards with one exception. As described in Section 7.3.3 of this document, if the average concentration of a pollutant in the influent samples collected from a facility was less than ten times the method detection level for that pollutant, EPA did not use the data for that pollutant at that facility to calculate long-term averages, variability factors, and candidate pretreatment standards, but did use the data to calculate the target average concentrations used to estimate pollutant loadings. Table 9-4 summarizes the target average concentrations that were used to estimate the baseline loadings for facilities with treatment in place.

As stated previously, baseline pollutant loadings for facilities with treatment in place were calculated based on the reported treatment system, type, hydraulic capacity, and the set of target average concentrations chosen for each facility's treated wastewater type. Each facility was given a treatment-in-place designation for their equipment type and hydraulic capacity with respect to the seven technology control options and corresponding target average concentrations shown in Table 9-4. By applying the appropriate set of target average concentrations to each facility's treated discharge flow, EPA estimated the baseline pollutant loadings from these facilities' treatment systems.

For most of the facilities that reported treating their wastewater, the target average concentrations chosen were based on pollutant concentration data from treatment systems equivalent to what each facility has in place. For example, the facilities that reported treating all of their process wastewater with DAF or chemical precipitation received a treatment-in-place designation of DAF-All and CP-All, respectively, based on their equipment type and hydraulic capacity. In addition, the set of target average concentrations chosen for these facilities are based on pollutant concentration data collected from DAF and CP systems treating total facility process wastewater streams, respectively (DAF-All and CP-All, as shown in Table 9-4). Similarly, facilities that reported DAF or chemical precipitation system hydraulic capacities that were sufficient to treat the wastewater generated from the laundering of their industrial textile items were given a treatment-in-place designation of DAF-IL and CP-IL, respectively. The target average concentrations were also chosen from the sets for DAF-IL and CP-IL, as shown in Table 9-4.

There were six facilities that reported treatment system capacities that were larger than required for one technology control option, but insufficient for another technology control option treating the next larger portion of wastewater with the same technology. For example, one facility shown in Table 9-3 reported having a chemical precipitation system that treats an amount of wastewater that is greater than that generated by laundering its heavy industrial textile items, but less than that its total industrial laundry wastewater. Since the facility has a treatment system larger than the CP-Heavy technology control option, but smaller than the CP-IL technology control option, it was given a treatment-in-place designation of "less than" (<) CP-IL. Further, since this facility reported treating wastewater generated from the laundering of items other than just its heavy industrial textile items, it was assumed that the treatment system effluent pollutant concentrations would be represented by the CP-IL set of target average concentrations

Table 9-4

Overall Target Average Concentrations for the Seven Technology Control Options for the Pollutants of Concern Used as the Bases for Calculation of Baseline Pollutant Loadings

Pollutant of Concern	Median Target Average Concentration (mg/L)[1]				
	CEB-Heavy[2]	Towel Only[3]	CP-Heavy[4]	DAF-IL/ DAF-All[5]	CP-IL/ CP-All[6]
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	1,040	1,310	1,390	497	399
Oil and Grease (measured as HEM)	268	230	38.2	37.8	28.5
Total Suspended Solids (TSS)	259	487	56.3	85.5	117
Priority Organics					
1,1,1-Trichloroethane	---	---	---	0.0100	0.390
1,2-Diphenylhydrazine	---	---	45.2	---	---
4-Chloro-3-methylphenol	0.205	---	---	0.151	0.0416
Bis(2-ethylhexyl) Phthalate	0.462	0.600	0.0469	0.144	0.0691
Butyl Benzyl Phthalate	---	---	0.0100	0.216	0.0100
Chlorobenzene	---	---	---	0.0280	0.0336
Chloroform	---	---	0.0527	0.185	0.0373
Di-*n*-butyl Phthalate	0.0100	0.170	0.0100	0.125	0.0100
Di-*n*-octyl Phthalate	0.0307	---	---	0.0280	0.0342
Ethylbenzene	0.305	1.37	0.0931	0.0605	0.154
Isophorone	---	---	---	---	0.300
Methylene Chloride	0.0360	---	---	0.546	0.126
Naphthalene	0.104	0.800	0.114	0.0764	0.0583
Phenol	---	---	---	0.211	---
Tetrachloroethene	0.286	---	0.127	0.250	0.421
Toluene	0.543	6.35	0.818	0.711	0.973
trans-1,2-Dichloroethene	---	---	---	---	---
Trichloroethene	---	---	0.0529	---	0.0363
Nonconventional Organics					
2-Butanone	0.113	4.68	0.421	17.4	1.68
2-Methylnaphthalene	0.0458	0.129	0.0100	0.116	0.0114
2-Propanone	1.21	7.42	---	13.6	1.54
4-Methyl-2-pentanone	0.0722	9.55	0.256	0.595	1.96
∝-Terpineol	0.0100	0.471	---	0.472	0.0464
Benzoic Acid	---	---	---	1.58	---
Benzyl Alcohol	---	---	---	---	0.342
Hexanoic Acid	0.128	---	---	---	0.203
m-Xylene	0.366	---	0.104	0.327	0.241
n-Decane	0.279	1.26	0.0240	0.469	0.0873
n-Docosane	0.0347	0.110	0.0120	0.0232	0.0113

Table 9-4 (Continued)

Pollutant of Concern	Median Target Average Concentration (mg/L)[1]				
	CEB-Heavy[2]	Towel Only[3]	CP-Heavy[4]	DAF-IL/ DAF-All[5]	CP-IL/ CP-All[6]
Nonconventional Organics (Continued)					
n-Dodecane	0.574	---	0.0100	0.195	1.46
n-Eicosane	0.0779	0.150	0.0382	0.0477	0.0150
n-Hexacosane	0.0100	---	0.0122	0.0195	0.0131
n-Hexadecane	0.0417	0.490	0.0315	0.0842	0.0413
n-Octacosane	0.0100	---	0.0100	0.0100	0.0168
n-Octadecane	0.0560	0.422	0.0100	0.0694	0.0308
n-Tetracosane	---	---	0.0329	0.0219	0.0121
n-Tetradecane	0.116	0.979	0.612	0.0754	0.0394
n-Triacontane	---	---	0.0341	0.0100	0.0119
o-&*p*-Xylene	0.359	---	0.0940	0.271	0.197
p-Cresol	---	---	---	0.117	---
p-Cymene	---	0.610	0.0208	0.0700	0.0100
Pentamethylbenzene	---	---	0.0100	---	---
Priority Metals and Elements					
Antimony	0.195	0.0438	0.0246	0.0593	0.0343
Arsenic	---	0.00866	0.00820	0.0259	0.0121
Beryllium	0.00208	---	0.00100	---	0.000650
Cadmium	0.132	0.00650	0.00500	0.0145	0.00774
Chromium	0.153	0.0715	0.0147	0.0695	0.0463
Copper	0.437	1.45	0.534	0.478	0.270
Lead	0.914	0.237	0.0473	0.175	0.0993
Mercury	0.000200	---	0.000206	0.000242	0.000329
Nickel	0.255	0.0225	0.0307	0.0406	0.0396
Selenium	---	---	0.0157	0.0524	0.00313
Silver	---	0.0846	0.00400	0.0188	0.00769
Thallium	---	---	---	0.00294	---
Zinc	6.78	0.903	0.0637	0.837	0.303
Nonconventional Metals and Elements					
Aluminum	6.33	1.34	0.0804	1.31	1.33
Barium	0.339	0.702	0.145	0.0584	0.155
Boron	1.64	---	11.4	0.522	0.383
Cobalt	---	0.0885	0.0149	0.0381	0.0195
Iron	47.3	19.0	0.366	2.79	1.78
Manganese	0.596	0.884	0.00768	0.0340	0.0318
Molybdenum	0.205	---	0.774	0.119	0.275
Tin	0.0642	0.0336	0.0300	0.0631	0.0299
Titanium	0.0818	0.0927	0.00453	0.0112	0.0461
Vanadium	0.0114	0.0162	0.0100	0.00700	0.00757
Yttrium	---	0.00410	0.00300	0.00208	0.00344

Table 9-4 (Continued)

Pollutant of Concern	Median Target Average Concentration (mg/L)[1]				
	CEB-Heavy[2]	Towel Only[3]	CP-Heavy[4]	DAF-IL/ DAF-All[5]	CP-IL/ CP-All[6]
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	2,460	3,320	2,510	998	1,270
Total Organic Carbon (TOC)	626	1,610	910	326	310
Total Petroleum Hydrocarbon (measured as SGT-HEM)[7]	200	42.1	7.20	13.7	10.2

[1]LTAs for these pollutants of concern were not calculated for all options for one or more of the following reasons: the pollutant was not treated by the technology; the pollutant was not detected in the influent wastewater; there was a process upset at the time samples were collected; the treatment performance data had inconsistent detection limits; or data considered a lower limit of the actual value. See Section 7.3 of this chapter for more details related to the data editing criteria.
[2]CEB-Heavy represents data from facilities using chemical emulsion breaking treatment of heavy wastewater.
[3]Towel Only represents data from facilities using DAF treatment of heavy wastewater.
[4]CP-Heavy represents data from facilities using chemical precipitation treatment of heavy wastewater.
[5]DAF-IL and DAF-All represent data from facilities using DAF treatment of all facility process wastewater.
[6]CP-IL and CP-All represent data from facilities using chemical precipitation treatment of all facility process wastewater.
[7]SGT-HEM is measured by Method 1664 (promulgated at 64 FR 26315; May 14, 1999). In this method, EPA defines SGT-HEM as non-polar material (NPM). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to SGT-HEM as total petroleum hydrocarbon (TPH).

HEM-Hexane extractable material.
SGT-HEM - Silica gel treated-hexane extractable material.

in estimating this facility's baseline pollutant loading. A similar assessment was performed for the remaining four facilities that reported chemical precipitation treatment of wastewater generated from fewer items than their heavy industrial textile items (<CP-Heavy) and one facility that reported DAF treatment of wastewater generated from more items than industrial towels, but fewer than all of its industrial textile items (<DAF-IL).

Table 9-5 summarizes the methodology used to estimate the baseline pollutant loadings for each model facility. EPA estimated baseline pollutant loadings for facilities with microfiltration or ultrafiltration treatment systems using the data for chemical precipitation treatment of industrial laundry and/or all process wastewater, as noted in the table.

9.3.3 Methodology Used to Estimate Industry Postcompliance Wastewater Loadings

Postcompliance pollutant loadings for each regulatory option represent the total industry wastewater pollutant loadings after implementation of a rule. Postcompliance pollutant loadings were estimated from the target average concentrations for each of the two regulatory options (i.e., DAF-IL and CP-IL) and the annual facility wastewater discharge flow for each of the 190 in-scope facilities as shown in the following equation:

$$\text{Postcompliance target average concentration (mg/L)} \times \text{Facility annual discharge flow (L/yr)} \times \frac{1\ \text{lb}}{453{,}600\ \text{mg}} = \text{Facility postcompliance annual loading (lbs/yr)}$$

EPA calculated target average concentrations used in estimating the postcompliance pollutant loadings from the analytical data described in Section 7.2 of this document. Prior to calculating the target average concentrations, the data were edited as discussed in Section 9.3.2 of this document. Table 9-4 presents the target average concentrations used to calculate postcompliance pollutant loadings for the regulatory options DAF-IL and CP-IL.

To estimate postcompliance loadings for facilities with treatment in place, EPA ranked the treatment technologies in use by their performance. Based on data and information collected during the development of the regulatory options, EPA determined that, when operated properly, ultrafiltration, microfiltration, and chemical precipitation generally achieve lower pollutant concentrations in treated wastewater than dissolved air flotation, and that dissolved air flotation achieves lower pollutant concentrations in treated wastewater than chemical emulsion breaking. Tables 9-6 and 9-7 present the methodologies used to estimate the postcompliance loadings for the DAF-IL and CP-IL regulatory options, based on the facility's treatment-in-place designation.

Table 9-5

Methodology Used to Estimate Baseline Loadings for the Industrial Laundries Industry

Treatment In Place	Source of Target Average Concentrations for Treated Baseline Loadings	Number of Model Facilities with Treatment In Place	Basis for Baseline Pollutant Loadings
None	NA	127[1]	Estimated from untreated wastewater concentrations
CEB-Heavy	CEB-Heavy	5[2]	Heavy industrial laundry stream loading estimated from target average concentrations for CEB-Heavy and light industrial laundry stream loading estimated from untreated wastewater concentrations
<DAF-IL	DAF-IL	1	Part of industrial laundry stream loading estimated from target average concentrations for DAF-IL and remaining industrial laundry and linen stream loading estimated from untreated wastewater concentrations
DAF-IL	DAF-IL	1	Industrial laundry stream loading estimated from the target average concentrations for DAF-IL and linen stream loading estimated from untreated wastewater concentrations
DAF-All	DAF-All	33	Total process stream loading estimated from target average concentrations for DAF-All[3]
<CP-Heavy	CP-Heavy	4	Part of heavy industrial laundry stream loading estimated from target average concentrations for CP-Heavy and remaining heavy industrial laundry and light industrial laundry stream loading estimated from untreated wastewater concentrations
<CP-IL	CP-IL	1[4]	Part of industrial laundry stream loading estimated from target average concentrations for CP-IL and remaining industrial laundry and linen stream loading estimated from untreated wastewater concentrations
CP-IL	CP-IL	1	Industrial laundry stream loading estimated from target average concentrations for CP-IL and linen stream loading estimated from untreated wastewater concentrations

Table 9-5 (Continued)

Treatment In Place	Source of Target Average Concentrations for Treated Baseline Loadings	Number of Model Facilities with Treatment In Place	Basis for Baseline Pollutant Loadings
CP-All	CP-All	17[5]	Total process stream loading estimated from target average concentrations for CP-All[6]

[1]Three of these facilities process the majority of their industrial laundry items with a dry-cleaning followed by water-washing process. EPA assumed these facilities would meet the limitations for the DAF-IL and CP-IL regulatory options without installing these treatment technologies. For the purposes of modeling, EPA estimated their baseline pollutant loadings from the target average concentrations calculated for the CP-IL regulatory option.
[2]Three facilities reported CEB treatment of the total wastewater stream. EPA does not have data representing CEB treatment of the total wastewater stream; the baseline pollutant loadings for these facilities were estimated assuming they are only treating heavy industrial laundry wastewater.
[3]The DAF-All target average concentrations are equivalent to the DAF-IL target average concentrations and are applied to the facilities' entire process wastewater annual flows.
[4]This facility operates a microfiltration unit. Since microfiltration can achieve lower final effluent pollutant concentrations than chemical precipitation when operated properly (2), this facility is considered to have better treatment in place than the CP-Heavy option.
[5]One of these facilities operates an ultrafiltration unit. Since ultrafiltration can achieve lower final effluent pollutant concentrations than chemical precipitation when operated properly (2), this facility is considered to have better treatment in place than the CP-All option.
[6]The CP-All target average concentrations are equivalent to the CP-IL target average concentrations and are applied to the facilities' entire process wastewater annual flows.

CEB - Chemical emulsion breaking.
CP - Chemical precipitation.
DAF - Dissolved air flotation.
IL - Industrial laundry.
NA - Not applicable.

Table 9-6

Methodology Used to Estimate Postcompliance Loadings for the DAF-IL Regulatory Option for the Industrial Laundries Industry

Treatment In Place	Source of Target Average Concentrations for Treated Baseline Loadings	Number of Model Facilities with Treatment In Place	Basis for Postcompliance Pollutant Loadings	Baseline Loadings Greater Than Postcompliance Loadings for DAF-IL (✓)
None	NA	127[1]	Industrial laundry stream loading estimated from the target average concentrations for DAF-IL and linen stream loading estimated from untreated wastewater concentrations	✓
CEB-Heavy	CEB-Heavy	5[2]		✓
<DAF-IL	DAF-IL	1		✓
DAF-IL	DAF-IL	1		
DAF-All	DAF-All	33	Total process stream loading estimated from target average concentrations for DAF-All[3]	
<CP-Heavy	CP-Heavy	4	Industrial laundry stream loading estimated from the target average concentrations for DAF-IL and linen stream loading estimated from untreated wastewater concentrations	✓
<CP-IL	CP-IL	1[4]		✓
CP-IL	CP-IL	1	Industrial laundry stream loading estimated from target average concentrations for CP-IL and linen stream loading estimated from untreated wastewater concentrations	
CP-All	CP-All	17[5]	Total process stream loading estimated from target average concentrations for CP-All[6]	

[1]Three of these facilities process the majority of their industrial laundry items with a dry-cleaning followed by water-washing process. EPA assumed these facilities would meet the limitations for the DAF-IL and CP-IL regulatory options without installing these treatment technologies. For the purposes of modeling, EPA estimated their baseline and postcompliance pollutant loadings from the target average concentrations calculated for the CP-IL regulatory option. These facilities were estimated to have no pollutant removals.
[2]Three facilities reported CEB treatment of the total wastewater stream. EPA does not have data representing CEB treatment of the total wastewater stream; the baseline pollutant loadings for these facilities were estimated assuming they are only treating heavy industrial laundry wastewater.
[3]The DAF-All target average concentrations are equivalent to the DAF-IL target average concentrations and are applied to the facilities' entire process wastewater annual flows.
[3]This facility operates a microfiltration unit. Since microfiltration can achieve lower final effluent pollutant concentrations than chemical precipitation when operated properly (2), this facility is considered to have better treatment in place than the CP-Heavy option.
[5]One of these facilities operates an ultrafiltration unit. Since ultrafiltration can achieve lower final effluent pollutant concentrations than chemical precipitation when operated properly (2), this facility is considered to have better treatment in place than the CP-All option.
[6]The CP-All target average concentrations are equivalent to the CP-IL target average concentrations and are applied to the facilities' entire process wastewater annual flows.

CEB - Chemical emulsion breaking. CP - Chemical precipitation. DAF - Dissolved air flotation. IL - Industrial laundry. NA - Not applicable.

Table 9-7

Methodology Used to Estimate Postcompliance Loadings for the CP-IL Regulatory Option for the Industrial Laundries Industry

Treatment In Place	Source of Target Average Concentrations for Treated Baseline Loadings	Number of Model Facilities with Treatment In Place	Basis for Postcompliance Pollutant Loadings	Baseline Loadings Greater Than Postcompliance Loadings for CP-IL (✓)
None	NA	127[1]	Industrial laundry stream loading estimated from the target average concentrations for CP-IL and linen stream loading estimated from untreated wastewater concentrations	✓
CEB-Heavy	CEB-Heavy	5[2]		✓
<DAF-IL	DAF-IL	1		✓
DAF-IL	DAF-IL	1		✓
DAF-All	DAF-All	33		✓
<CP-Heavy	CP-Heavy	4		✓
<CP-IL	CP-IL	1[3]		✓
CP-IL	CP-IL	1		
CP-All	CP-All	17[4]	Total process stream loading estimated from target average concentrations for CP-All[5]	

[1]Three of these facilities process the majority of their industrial laundry items with a dry-cleaning followed by water-washing process. EPA assumed these facilities would meet the limitations for the DAF-IL and CP-IL regulatory options without installing these treatment technologies. For the purposes of modeling, EPA estimated their baseline and postcompliance pollutant loadings from the target average concentrations calculated for the CP-IL regulatory option. These facilities were estimated to have no pollutant removals.
[2]Three facilities reported CEB treatment of the total wastewater stream. EPA does not have data representing CEB treatment of the total wastewater stream; the baseline pollutant loadings for these facilities were estimated assuming they are only treating heavy industrial laundry wastewater.
[3]This facility operates a microfiltration unit. Since microfiltration can achieve lower final effluent pollutant concentrations than chemical precipitation when operated properly (2), this facility is considered to have better treatment in place than the CP-Heavy option.
[4]One of these facilities operates an ultrafiltration unit. Since ultrafiltration can achieve lower final effluent pollutant concentrations than chemical precipitation when operated properly (2), this facility is considered to have better treatment in place than the CP-All option.
[5]The CP-All target average concentrations are equivalent to the CP-IL target average concentrations and are applied to the facilities' entire process wastewater annual flows.

CEB - Chemical emulsion breaking.
CP - Chemical precipitation.
DAF - Dissolved air flotation.
IL - Industrial laundry.
NA - Not applicable.

9.3.4 Methodology Used to Estimate POTW Baseline and Postcompliance Wastewater Loadings

POTW baseline pollutant loadings represent the loadings from industrial laundries discharged through POTWs to surface water in 1993, based on POTW removal efficiencies for the pollutants of concern. The POTW baseline loadings account for the removal of pollutants from untreated industrial laundry wastewater by treatment technologies in place at industrial laundries, as previously discussed in Section 9.3.2. The POTW baseline pollutant loadings were calculated for each of the 190 in-scope facilities, as shown in the following equation:

$$\underset{\text{(lbs/yr)}}{\text{Facility baseline annual loading}} \times (1 - \text{POTW pollutant removal efficiency}) = \underset{\text{(lbs/yr)}}{\text{POTW baseline annual loading}}$$

POTW postcompliance pollutant loadings for each of the regulatory options take into account loadings from industrial laundries discharged through POTWs to surface water after implementation of a rule. POTW postcompliance pollutant loadings account for the removal of pollutants from industrial laundry wastewater after implementation of the regulatory options, as previously discussed in Section 9.3.3. The POTW postcompliance pollutant loadings were calculated for each of the 190 in-scope facilities, as shown in the following equation:

$$\underset{\text{(lbs/yr)}}{\text{Facility postcompliance annual loading}} \times (1 - \text{POTW pollutant removal efficiency}) = \underset{\text{(lbs/yr)}}{\text{POTW postcompliance annual loading}}$$

The POTW pollutant removal efficiencies that were used to calculate POTW baseline and postcompliance loadings are shown for each pollutant of concern in Table 9-8. Chapter 7 of this document describes the methods used to estimate the POTW removal efficiencies.

9.3.5 Methodology Used to Estimate Industry and POTW Pollutant Removals

Industry pollutant removals represent the difference between industry baseline loadings and postcompliance loadings for each regulatory option. Because all the identified industrial laundries are indirect dischargers, the removals presented here represent removals of pollutants being discharged to POTWs. EPA calculated the pollutant removals for each facility using the following equation:

$$\underset{\text{(lbs/yr)}}{\text{Facility baseline annual loading}} - \underset{\text{(lbs/yr)}}{\text{Facility postcompliance annual loading}} = \underset{\text{(lbs/yr)}}{\text{Facility pollutant removals}}$$

EPA used the following methodology to estimate pollutant removals:

1) If the facility postcompliance annual loading of a pollutant was higher than the facility baseline annual loading, the facility pollutant removal was set to zero;

Table 9-8

POTW Pollutant Removal Efficiencies for the Pollutants of Concern

Pollutant of Concern	POTW Pollutant Removal Efficiency
Conventionals	
Biochemical Oxygen Demand 5-Day (BOD_5)	91%
Oil and Grease (measured as HEM)	87%
Total Suspended Solids (TSS)	91%
Priority Organics	
1,1,1-Trichloroethane	24%
1,2-Diphenylhydrazine	62%
4-Chloro-3-methylphenol	63%
Bis(2-ethylhexyl) Phthalate	60%
Butyl Benzyl Phthalate	86%
Chlorobenzene	24%
Chloroform	24%
Di-*n*-butyl Phthalate	75%
Di-*n*-octyl Phthalate	33%
Ethylbenzene	33%
Isophorone	62%
Methylene Chloride	18%
Naphthalene	18%
Phenol	95%
Tetrachloroethene	33%
Toluene	33%
trans-1,2-Dichloroethene	33%
Trichloroethene	33%
Nonconventional Organics	
2-Butanone	18%
2-Methylnaphthalene	28%
2-Propanone	85%
4-Methyl-2-pentanone	18%
∝-Terpineol	18%
Benzoic Acid	81%
Benzyl Alcohol	33%
Hexanoic Acid	33%

Table 9-8 (Continued)

Pollutant of Concern	POTW Pollutant Removal Efficiency
Nonconventional Organics (Continued)	
m-Xylene	33%
n-Decane	33%
n-Docosane	94%
n-Dodecane	33%
n-Eicosane	33%
n-Hexacosane	94%
n-Hexadecane	33%
n-Octacosane	94%
n-Octadecane	33%
n-Tetracosane	94%
n-Tetradecane	33%
n-Triacontane	94%
o-&*p*-Xylene	33%
p-Cresol	72%
p-Cymene	99%
Pentamethylbenzene	91%
Priority Metals and Elements	
Antimony	72%
Arsenic	40%
Beryllium	61%
Cadmium	91%
Chromium	91%
Copper	84%
Lead	92%
Mercury	33%
Nickel	52%
Selenium	34%
Silver	80%
Thallium	28%
Zinc	77%
Nonconventional Metals and Elements	
Aluminum	88%
Barium	35%

Table 9-8 (Continued)

Pollutant of Concern	POTW Pollutant Removal Efficiency
Nonconventional Metals and Elements (Continued)	
Boron	14%
Cobalt	4%
Iron	83%
Manganese	41%
Molybdenum	52%
Tin	65%
Titanium	69%
Vanadium	42%
Yttrium	58%
Bulk Nonconventionals	
Chemical Oxygen Demand (COD)	82%
Total Organic Carbon (TOC)	71%
Total Petroleum Hydrocarbon (measured as SGT-HEM)[1]	74%

[1] Silica gel treated-hexane extractable material (SGT-HEM) is measured by Method 1664 (promulgated at 64 FR 26315; May 14, 1999). In this method, EPA defines SGT-HEM as non-polar material (NPM). Throughout this document and the Industrial Laundries Administrative Record, EPA refers to SGT-HEM as total petroleum hydrocarbon (TPH).

2) If the pollutant was not present at baseline, the removal was set to zero; and

3) If a target average concentration was not calculated for a pollutant for a regulatory option (i.e., the postcompliance loading for the pollutant could not be calculated), the removal was set to zero.

Each of the facility pollutant removals were extrapolated using the facility survey weights to calculate the total industry pollutant removals for each of the regulatory options.

Similarly, POTW pollutant removals represent the difference between POTW baseline annual loadings and postcompliance annual loadings for each regulatory option. The POTW pollutant removals represent the annual amount of pollutants that would be removed from surface water after implementation of a rule. EPA calculated the POTW pollutant removals for each facility using the following equation:

$$\underset{\text{(lbs/yr)}}{\text{POTW baseline annual loading}} - \underset{\text{(lbs/yr)}}{\text{POTW postcompliance annual loading}} = \underset{\text{(lbs/yr)}}{\text{POTW pollutant removals}}$$

Each of the POTW pollutant removals were extrapolated to calculate the total POTW pollutant removal for the industrial laundries industry for each of the regulatory options.

9.4 Pollutant Loadings and Removals

EPA estimated annual industry untreated, baseline, and postcompliance loadings for each of the regulatory options using the methodology described in Section 9.3 of this document. EPA extrapolated the facility-specific loadings and removals from the 190 in-scope facilities (and subsets of the 190 facilities) to represent the entire industry of 1,742 facilities (and subsets of the industry). In addition, EPA estimated the POTW annual baseline and postcompliance loadings from industrial laundries discharged by POTWs to surface water for each of the regulatory options using the methodology described in Section 9.3.4 of this document. EPA extrapolated the POTW loadings and removals, as described previously. Tables summarizing the loadings and pollutant removals from industrial laundry and POTW effluents for each pollutant of concern are included in Appendix E of this document.

The following tables (presented at the end of this chapter) summarize the industry and POTW baseline and postcompliance pollutant loadings, the POTW pollutant removals, and the POTW toxic-weighted pollutant removals (in total pounds and in pound equivalents) for total priority and nonconventional pollutant groupings:

- Tables 9-9 and 9-10 -- present industry and POTW baseline and postcompliance loadings, the POTW pollutant removals, and the POTW toxic-weighted pollutant removals for all 1,742 facilities for CP-IL and DAF-IL, respectively;

- Tables 9-11 and 9-12 -- present industry and POTW baseline and postcompliance loadings, the POTW pollutant removals, and the POTW toxic-weighted pollutant removals for 1,606 facilities included in the CP-IL and DAF-IL regulatory options under the "1 Million/255 K" exclusion, respectively;

- Tables 9-13 and 9-14 -- present industry and POTW baseline and postcompliance loadings, the POTW pollutant removals, and the POTW toxic-weighted pollutant removals for 1,224 facilities included in the CP-IL and DAF-IL regulatory options under the "3 Million/120 K" exclusion, respectively; and

- Tables 9-15 and 9-16 -- present industry and POTW baseline and postcompliance loadings, the POTW pollutant removals, and the POTW toxic-weighted pollutant removals for 789 facilities included in the CP-IL and DAF-IL regulatory options under the "5 Million/255 K" exclusion, respectively.

EPA estimates toxic-weighted pollutant removals by multiplying pounds of a pollutant removed by an assigned toxic weighting factor to obtain the "pound equivalent" pollutant removals. The assigned toxic weighting factor for each pollutant is based on the pollutant's relative toxicity to copper. The toxic weighting factors assigned to each pollutant of concern can be found in the Industrial Laundries Administrative Record and the Cost-Effectiveness Analysis document (3).

9.5 Pollutant Loadings and Removals Estimated from 1998 Facility Treatment-In-Place Data

The industrial laundries trade associations (the Uniform and Textile Service Association (UTSA) and the Textile Rental Services Association (TRSA)) performed a survey of all industrial laundries that were sent a detailed questionnaire. More information on the types of data collected by the UTSA/TRSA survey is provided in Section 3.7.2 of this document.. The purpose of the survey was to provide EPA with 1998 data on treatment technologies in place at industrial laundries. Of the 190 in-scope facilities, 162 responded to the UTSA/TRSA survey. Section 6.5.16 of this document summarizes the types of equipment that were reported in the survey.

At proposal (62 FR 66181; December 17, 1997), EPA estimated the industry and POTW pollutant removals based on treatment-in-place information reported in the detailed questionnaire for the 1993 operating year. For the Notice of Data Availability (NODA) (63 FR 71054; December 23, 1998); EPA compared the pollutant removals estimated at proposal to the industry and POTW pollutant removals estimated using the treatment-in-place information reported in the UTSA/TRSA survey for the 1998 operating year for the DAF-IL and CP-IL regulatory options with the 1 Million/255 K exclusion. EPA's methodology and the results of the comparison are discussed below.

EPA compared the treatment system description contained in the UTSA/TRSA survey to the treatment system components reported in the detailed questionnaire for each facility. Most facilities did not report the treatment system design parameters of the treatment units reported in the UTSA/TRSA survey. To calculate the changes in the industry and POTW baseline pollutant loadings, EPA made the following assumptions when reviewing the UTSA/TRSA survey data:

- EPA continued to use the flow and production data that was reported in the detailed questionnaire for all facilities.
- For facilities that reported that they treat a portion of their wastewater and did not indicate the percentage of wastewater treated, EPA assumed that they are treating only a small portion of their total wastewater.
- For facilities that reported DAF, chemical precipitation, or chemical emulsion breaking treatment, EPA assumed that the facility is operating these systems in a manner equivalent to the technology control options costed by EPA.
- For facilities that provided treatment system descriptions that were not detailed enough for EPA to make judgement regarding the treatment system, EPA assumed that they are still operating the treatment system reported in the detailed questionnaire.
- For a facility that reported possible biological treatment, EPA assumed that it does not have treatment in place equivalent to any of the technology control options.
- For a denim prewash facility that operated a partial treatment system, EPA assumed that it treats wastewater from all items except for the denim prewash, which is not included in the scope of the rule.
- EPA did not reduce costs to reflect ancillary treatment technologies (e.g., screens, filter presses, equalization tanks) added since those reported in the detailed questionnaire.
- EPA did not make any changes in the compliance costs for ten facilities that reported closing or rebuilding since 1993.
- For facilities that reported that they planned to install treatment systems in the future, EPA assumed that they are still operating the treatment system reported in the detailed questionnaire.
- EPA assumed facilities that did not respond to the UTSA/TRSA survey (28 out of the 190 in-scope facilities) were still operating the treatment system reported in the detailed questionnaire.

Table 9-17 presents a comparison of the POTW pollutant removals estimated for the proposal and the POTW pollutant removals estimated using the UTSA/TRSA survey data for the CP-IL and DAF-IL regulatory options with the 1 Million/255 K exclusion. Table 9-18 presents this comparison for the industry pollutant removals. The pollutant loadings and removals were calculated using the assumptions and methodologies described previously in this chapter. By incorporating the treatment-in-place information reported in the UTSA/TRSA survey, the baseline pollutant loadings were changed for those facilities that reported adding or changing the treatment technologies reported in the detailed questionnaire. Because the industry and POTW pollutant removals are a function of the baseline pollutant loadings, the pollutant removals also changed. The total POTW pollutant removals were estimated to decrease by 8.9 million pounds and 9.5 million pounds (32 percent and 33 percent) from 1993 to 1998 in the CP-IL and DAF-IL options, respectively. The total industry pollutant removals were estimated to decrease by 50 million pounds and 53 million pounds (32 percent for each) from 1993 to 1998 in the CP-IL and DAF-IL options, respectively. Based on this comparison, EPA estimates that the actual pollutant loadings and removals for the industrial laundries industry to comply with the regulatory options (regardless of the specific exclusion) would be less than the pollutant loadings and removals for the final action, based on the 1993 operating year.

9.6 References

1. U.S. Environmental Protection Agency. Technical Development Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category. EPA-821-R-97-007, Washington, DC, November 1997.

2. Bartram, Gary H., Crossflow Microfiltration, A Cost Effective Approach to Treat Metals, Oil and Grease in the Industrial Laundries and Metal Finishing Industries, EPOC Filtration and Separation Systems, Fresno, CA, February 1993.

3. U.S. Environmental Protection Agency. Cost-Effectiveness Analysis for the Final Action Regarding Pretreatment Standards for the Industrial Laundries Point Source Category (Revised February 2000). EPA-821-R-00-005, Washington, DC, February 2000.

Table 9-9

Summary of Baseline Pollutant Loadings, Postcompliance Pollutant Loadings, and POTW Pollutant Removals from Industrial Laundries Wastewater for CP-IL[1] Entire Industry[2]

Pollutant Group	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	POTW Baseline Wastewater Pollutant Loading (lbs/yr)
Total Priority Organics	683,114	392,545
Total Nonconventional Organics	1,805,347	1,030,225
Total Priority Metals and Elements	487,665	99,114
Total Nonconventional Metals and Elements	2,180,096	414,749
Total Pollutants	**5,156,222**	**1,936,633**
	Industry Postcompliance Wastewater Pollutant Loading (lbs/yr)	**POTW Postcompliance Wastewater Pollutant Loading (lbs/yr)**
Total Priority Organics	429,496	259,950
Total Nonconventional Organics	893,523	501,493
Total Priority Metals and Elements	226,084	49,517
Total Nonconventional Metals and Elements	1,148,083	231,056
Total Pollutants	**2,697,186**	**1,042,016**
	Total Pollutant Removal from POTW Effluents (lbs/yr)	**Total Toxic Weighted Pollutant Removal from POTW Effluents (lb-equivalents/yr)**
Total Priority Organics	132,595	4,712
Total Nonconventional Organics	528,732	2,321
Total Priority Metals and Elements	49,597	32,200
Total Nonconventional Metals and Elements	183,693	3,685
Total Pollutants	**894,617**	**42,918**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]The entire industrial laundries industry is estimated to consist of 1,742 facilities.

Table 9-10

Summary of Baseline Pollutant Loadings, Postcompliance Pollutant Loadings, and POTW Pollutant Removals from Industrial Laundries Wastewater for DAF-IL[1] Entire Industry[2]

Pollutant Group	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	POTW Baseline Wastewater Pollutant Loading (lbs/yr)
Total Priority Organics	683,114	392,545
Total Nonconventional Organics	1,805,347	1,030,225
Total Priority Metals and Elements	487,665	99,114
Total Nonconventional Metals and Elements	2,180,096	414,749
Total Pollutants	**5,156,222**	**1,936,633**
	Industry Postcompliance Wastewater Pollutant Loading (lbs/yr)	**POTW Postcompliance Wastewater Pollutant Loading (lbs/yr)**
Total Priority Organics	461,552	262,030
Total Nonconventional Organics	951,992	510,533
Total Priority Metals and Elements	299,142	64,029
Total Nonconventional Metals and Elements	1,223,799	242,167
Total Pollutants	**2,936,485**	**1,078,759**
	Total Pollutant Removal from POTW Effluents (lbs/yr)	**Total Toxic Weighted Pollutant Removal from POTW Effluents (lb-equivalents/yr)**
Total Priority Organics	130,515	4,812
Total Nonconventional Organics	519,692	2,248
Total Priority Metals and Elements	35,086	25,006
Total Nonconventional Metals and Elements	172,582	3,179
Total Pollutants	**857,875**	**35,245**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]The entire industrial laundries industry is estimated to consist of 1,742 facilities.

Table 9-11

Summary of Baseline Pollutant Loadings, Postcompliance Pollutant Loadings, and POTW Pollutant Removals from Industrial Laundries Wastewater for CP-IL[1]

Excluding Facilities with Less than 1 Million Pounds per Year Total Production and Less than 255,000 Pounds per Year Shop and Printer Towel Production[2]

Pollutant Group	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	POTW Baseline Wastewater Pollutant Loading (lbs/yr)
Total Priority Organics	673,848	387,038
Total Nonconventional Organics	1,775,897	1,012,832
Total Priority Metals and Elements	481,921	98,031
Total Nonconventional Metals and Elements	2,161,142	410,917
Total Pollutants	**5,092,808**	**1,908,818**
	Industry Postcompliance Wastewater Pollutant Loading (lbs/yr)	**POTW Postcompliance Wastewater Pollutant Loading (lbs/yr)**
Total Priority Organics	426,467	258,109
Total Nonconventional Organics	886,592	497,609
Total Priority Metals and Elements	224,544	49,178
Total Nonconventional Metals and Elements	1,140,153	229,447
Total Pollutants	**2,677,756**	**1,034,343**
	Total Pollutant Removal from POTW Effluents (lbs/yr)	**Total Toxic Weighted Pollutant Removal from POTW Effluents (lb-equivalents/yr)**
Total Priority Organics	128,929	4,603
Total Nonconventional Organics	515,223	2,262
Total Priority Metals and Elements	48,852	31,663
Total Nonconventional Metals and Elements	181,470	3,627
Total Pollutants	**874,474**	**42,155**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]136 of the 1,742 total industrial laundries are excluded from compliance under this criterion.

Table 9-12

Summary of Baseline Pollutant Loadings, Postcompliance Pollutant Loadings, and POTW Pollutant Removals from Industrial Laundries Wastewater for DAF-IL[1]

Excluding Facilities with Less than 1 Million Pounds per Year Total Production and Less than 255,000 Pounds per Year Shop and Printer Towel Production[2]

Pollutant Group	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	POTW Baseline Wastewater Pollutant Loading (lbs/yr)
Total Priority Organics	673,848	387,038
Total Nonconventional Organics	1,775,897	1,012,832
Total Priority Metals and Elements	481,921	98,031
Total Nonconventional Metals and Elements	2,161,142	410,917
Total Pollutants	**5,092,808**	**1,908,818**
	Industry Postcompliance Wastewater Pollutant Loading (lbs/yr)	**POTW Postcompliance Wastewater Pollutant Loading (lbs/yr)**
Total Priority Organics	457,889	260,017
Total Nonconventional Organics	943,083	506,064
Total Priority Metals and Elements	297,093	63,589
Total Nonconventional Metals and Elements	1,215,322	240,470
Total Pollutants	**2,913,387**	**1,070,140**
	Total Pollutant Removal from POTW Effluents (lbs/yr)	**Total Toxic Weighted Pollutant Removal from POTW Effluents (lb-equivalents/yr)**
Total Priority Organics	127,021	4,702
Total Nonconventional Organics	506,768	2,192
Total Priority Metals and Elements	34,442	24,522
Total Nonconventional Metals and Elements	170,447	3,126
Total Pollutants	**838,678**	**34,542**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]136 of the 1,742 total industrial laundries are excluded from compliance under this criterion.

Table 9-13

Summary of Baseline Pollutant Loadings, Postcompliance Pollutant Loadings, and POTW Pollutant Removals from Industrial Laundries Wastewater for CP-IL[1]

Excluding Facilities with Less than 3 Million Pounds per Year Total Production and Less than 120,000 Pounds per Year Shop and Printer Towel Production[2]

Pollutant Group	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	POTW Baseline Wastewater Pollutant Loading (lbs/yr)
Total Priority Organics	631,744	363,259
Total Nonconventional Organics	1,647,212	937,119
Total Priority Metals and Elements	441,515	89,899
Total Nonconventional Metals and Elements	1,971,667	375,981
Total Pollutants	**4,692,138**	**1,766,258**
	Industry Postcompliance Wastewater Pollutant Loading (lbs/yr)	**POTW Postcompliance Wastewater Pollutant Loading (lbs/yr)**
Total Priority Organics	398,718	241,190
Total Nonconventional Organics	830,949	466,402
Total Priority Metals and Elements	210,022	46,139
Total Nonconventional Metals and Elements	1,071,075	215,162
Total Pollutants	**2,510,764**	**968,893**
	Total Pollutant Removal from POTW Effluents (lbs/yr)	**Total Toxic Weighted Pollutant Removal from POTW Effluents (lb-equivalents/yr)**
Total Priority Organics	122,069	4,245
Total Nonconventional Organics	470,717	2,063
Total Priority Metals and Elements	43,760	28,913
Total Nonconventional Metals and Elements	160,819	3,262
Total Pollutants	**797,365**	**38,483**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]518 of the 1,742 total industrial laundries are excluded from compliance under this criterion. This exclusion includes the 136 facilities under the 1 Million/255K exclusion shown in Table 9-11.

Table 9-14

Summary of Baseline Pollutant Loadings, Postcompliance Pollutant Loadings, and POTW Pollutant Removals from Industrial Laundries Wastewater for DAF-IL[1]

Excluding Facilities with Less than 3 Million Pounds per Year Total Production and Less than 120,000 Pounds per Year Shop and Printer Towel Production[2]

Pollutant Group	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	POTW Baseline Wastewater Pollutant Loading (lbs/yr)
Total Priority Organics	631,744	363,259
Total Nonconventional Organics	1,647,212	937,119
Total Priority Metals and Elements	441,515	89,899
Total Nonconventional Metals and Elements	1,971,667	375,981
Total Pollutants	**4,692,138**	**1,766,258**
	Industry Postcompliance Wastewater Pollutant Loading (lbs/yr)	**POTW Postcompliance Wastewater Pollutant Loading (lbs/yr)**
Total Priority Organics	429,619	244,426
Total Nonconventional Organics	891,855	478,361
Total Priority Metals and Elements	272,614	58,576
Total Nonconventional Metals and Elements	1,136,150	224,949
Total Pollutants	**2,730,238**	**1,006,312**
	Total Pollutant Removal from POTW Effluents (lbs/yr)	**Total Toxic Weighted Pollutant Removal from POTW Effluents (lb-equivalents/yr)**
Total Priority Organics	118,833	4,335
Total Nonconventional Organics	458,757	1,987
Total Priority Metals and Elements	31,323	22,458
Total Nonconventional Metals and Elements	151,033	2,798
Total Pollutants	**759,946**	**31,578**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]518 of the 1,742 total industrial laundries are excluded from compliance under this criterion. This exclusion includes the 136 facilities under the 1 Million/255K exclusion shown in Table 9-12.

Table 9-15

Summary of Baseline Pollutant Loadings, Postcompliance Pollutant Loadings, and POTW Pollutant Removals from Industrial Laundries Wastewater for CP-IL[1]

Excluding Facilities with Less than 5 Million Pounds per Year Total Production and Less than 255,000 Pounds per Year Shop and Printer Towel Production[2]

Pollutant Group	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	POTW Baseline Wastewater Pollutant Loading (lbs/yr)
Total Priority Organics	524,074	301,652
Total Nonconventional Organics	1,344,436	761,153
Total Priority Metals and Elements	353,460	72,129
Total Nonconventional Metals and Elements	1,563,066	299,886
Total Pollutants	**3,785,036**	**1,434,820**
	Industry Postcompliance Wastewater Pollutant Loading (lbs/yr)	**POTW Postcompliance Wastewater Pollutant Loading (lbs/yr)**
Total Priority Organics	352,002	196,341
Total Nonconventional Organics	685,436	384,765
Total Priority Metals and Elements	170,841	37,765
Total Nonconventional Metals and Elements	879,286	176,506
Total Pollutants	**2,060,565**	**795,377**
	Total Pollutant Removal from POTW Effluents (lbs/yr)	**Total Toxic Weighted Pollutant Removal from POTW Effluents (lb-equivalents/yr)**
Total Priority Organics	105,310	3,443
Total Nonconventional Organics	376,388	1,646
Total Priority Metals and Elements	34,364	23,713
Total Nonconventional Metals and Elements	123,380	2,601
Total Pollutants	**639,442**	**31,403**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]953 of the 1,742 total industrial laundries are excluded from compliance under this criterion.

Table 9-16

Summary of Baseline Pollutant Loadings, Postcompliance Pollutant Loadings, and POTW Pollutant Removals from Industrial Laundries Wastewater for DAF-IL[1]

Excluding Facilities with Less than 5 Million Pounds per Year Total Production and Less than 255,000 Pounds per Year Shop and Printer Towel Production[2]

Pollutant Group	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	POTW Baseline Wastewater Pollutant Loading (lbs/yr)
Total Priority Organics	524,074	301,652
Total Nonconventional Organics	1,344,436	761,153
Total Priority Metals and Elements	353,460	72,129
Total Nonconventional Metals and Elements	1,563,066	299,886
Total Pollutants	**3,785,036**	**1,434,820**
	Industry Postcompliance Wastewater Pollutant Loading (lbs/yr)	**POTW Postcompliance Wastewater Pollutant Loading (lbs/yr)**
Total Priority Organics	355,948	202,715
Total Nonconventional Organics	748,338	400,907
Total Priority Metals and Elements	214,235	46,395
Total Nonconventional Metals and Elements	924,266	183,854
Total Pollutants	**2,242,787**	**833,871**
	Total Pollutant Removal from POTW Effluents (lbs/yr)	**Total Toxic Weighted Pollutant Removal from POTW Effluents (lb-equivalents/yr)**
Total Priority Organics	98,937	3,525
Total Nonconventional Organics	360,245	1,563
Total Priority Metals and Elements	25,734	18,488
Total Nonconventional Metals and Elements	116,032	2,199
Total Pollutants	**600,948**	**25,775**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]953 of the 1,742 total industrial laundries are excluded from compliance under this criterion.

Table 9-17

POTW Pollutant Removal Comparison Between the Removals Estimated at Proposal and Removals Incorporating UTSA/TRSA Survey Data for the CP-IL and DAF-IL Regulatory Options[1]

Excluding Facilities with Less than 1 Million Pounds per Year Total Production and Less than 255,000 Pounds per Year Shop and Printer Towel/Rag Production[2]

Pollutant Grouping	POTW Pollutant Removal Estimated for Proposal[3] (1993 lbs/yr)	POTW Pollutant Removal Estimated Based on UTSA/TRSA Survey[4] (1998 lbs/yr)	Percent Decrease in POTW Pollutant Removal
CP-IL			
Total Bulk Conventionals	6,020,955	4,471,490	26%
Total Bulk Nonconventionals	20,226,788	13,226,655	35%
Total Bulk Parameters	**26,247,743**	**17,698,145**	**33%**
Total Priority Organics	157,067	101,571	35%
Total Nonconventional Organics	725,659	504,789	30%
Total Organics	**882,726**	**606,360**	**31%**
Total Priority Metals and Elements	52,263	39,828	24%
Total Nonconventional Metals and Elements	125,516	114,068	9%
Total Metals and Elements	**177,779**	**153,896**	**13%**
Total Pollutants	**27,308,248**	**18,458,401**	**32%**
DAF-IL			
Total Bulk Conventionals	6,149,908	4,559,753	26%
Total Bulk Nonconventionals	21,268,017	13,732,557	35%
Total Bulk Parameters	**27,417,925**	**18,292,310**	**33%**
Total Priority Organics	180,908	110,677	39%
Total Nonconventional Organics	783,871	549,338	30%
Total Organics	**964,779**	**660,015**	**32%**

Table 9-17 (Continued)

Pollutant Grouping	POTW Pollutant Removal Estimated for Proposal[3] (1993 lbs/yr)	POTW Pollutant Removal Estimated Based on UTSA/TRSA Survey[4] (1998 lbs/yr)	Percent Decrease in POTW Pollutant Removal
Total Priority Metals and Elements	34,535	25,063	27%
Total Nonconventional Metals and Elements	135,543	119,054	12%
Total Metals and Elements	**170,078**	**144,117**	**15%**
Total Pollutants	**28,552,782**	**19,096,442**	**33%**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]136 of the 1,742 total industrial laundries are excluded from compliance under this criterion.
[3]The removals estimated for proposal (62 FR 66181; December 17, 1997) are based on treatment-in-place information from the detailed questionnaire for the 1993 operating year.
[4]The removals were estimated based on treatment-in-place information in the UTSA/TRSA survey for the 1998 operating year (presented in the Notice of Data Availability, 63 FR 71054; December 23, 1998).

Table 9-18

Industry Pollutant Removal Comparison Between the Removals Estimated at Proposal and Removals Incorporating UTSA/TRSA Survey Data for the CP-IL and DAF-IL Regulatory Options[1]

Excluding Facilities with Less than 1 Million Pounds per Year Total Production and Less than 255,000 Pounds per Year Shop and Printer Towel/Rag Production[2]

Pollutant Grouping	Industry Pollutant Removal Estimated for Proposal[3] (1993 lbs/yr)	Industry Pollutant Removal Estimated Based on UTSA/TRSA Survey[4] (1998 lbs/yr)	Percent Decrease in Industry Pollutant Removal
CP-IL			
Total Bulk Conventionals	57,702,653	42,466,234	26%
Total Bulk Nonconventionals	98,227,707	64,012,182	35%
Total Bulk Parameters	**155,930,360**	**106,478,416**	**32%**
Total Priority Organics	210,212	172,624	18%
Total Nonconventional Organics	754,444	534,573	29%
Total Organics	**964,656**	**707,197**	**27%**
Total Priority Metals and Elements	272,883	217,645	20%
Total Nonconventional Metals and Elements	703,067	712,265	(1%)
Total Metals and Elements	**975,950**	**929,910**	**5%**
Total Pollutants	**157,870,966**	**108,115,523**	**32%**
DAF-IL			
Total Bulk Conventionals	59,446,266	43,743,855	26%
Total Bulk Nonconventionals	103,854,831	66,935,920	36%
Total Bulk Parameters	**163,301,097**	**110,679,775**	**32%**
Total Priority Organics	221,062	139,853	37%
Total Nonconventional Organics	845,004	604,197	28%
Total Organics	**1,066,066**	**744,050**	**30%**

Table 9-18 (Continued)

Pollutant Grouping	Industry Pollutant Removal Estimated for Proposal[3] (1993 lbs/yr)	Industry Pollutant Removal Estimated Based on UTSA/TRSA Survey[4] (1998 lbs/yr)	Percent Decrease in Industry Pollutant Removal
Total Priority Metals and Elements	183,359	134,461	27%
Total Nonconventional Metals and Elements	732,951	726,346	1%
Total Metals and Elements	**916,310**	**860,807**	**6%**
Total Pollutants	**165,283,473**	**112,284,632**	**32%**

[1]Numbers in this table were calculated using more significant figures than shown.
[2]136 of the 1,742 total industrial laundries are excluded from compliance under this criterion.
[3]The removals estimated for proposal (62 FR 66181; December 17, 1997) are based on treatment-in-place information from the detailed questionnaire for the 1993 operating year.
[4]The removals were estimated based on treatment-in-place information in the UTSA/TRSA survey for the 1998 operating year (presented in the Notice of Data Availability, 63 FR 71054; December 23, 1998).